Welcome to the 2018 Process Education Conference!

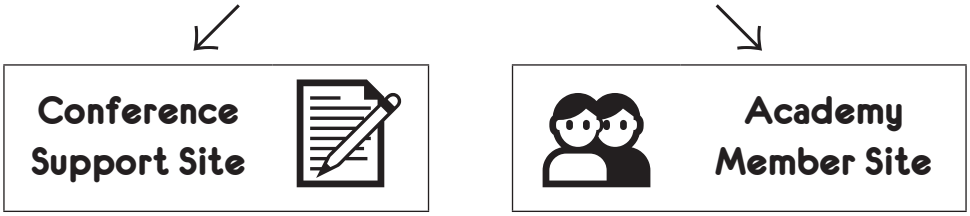
The Academy of Process Educators is pleased to have you with us. This binder is intended to help you select from among exciting session alternatives, prepare yourself to get the most out of your time at the conference, and organize valuable teaching/learning resources for future reference. Separate tabs are used for each day. Each tab begins with a detailed schedule for that day that includes session titles, presenters/facilitators, locations, and page numbers for more detailed information. Within each tab, session materials are ordered sequentially by time of day.

BINDER CONTENTS

(Details are listed on first page of each tab)

Note that some resources are available online in lieu of inclusion in this binder. When a resource is online, it may be found through this URL:

www.processeducation.org/moo/moodle/



Simply select the PE Conference Support Site instead of the Academy Member Site.

(Page 1-16 gives the information you need in order to access those sites!)

But why bother? Just use the QR codes at the top of each session's page!

Wonder how? http://lmgtfy.com/?q=how+to+use+QR+codes

Notes

Section 1

GENERAL INFORMATION

YOUR ACADEMY BOARD

President: Mary Moore, University of Indianapolis

President Elect: Matthew Watts, Tidewater Community College

Past President: Joyce Adams, Hinds Community College

Secretary: Teressa Taylor, North Carolina Central University

Finance Officer: Elizabeth Mahaffey, Hinds Community College

Treasurer: Peter Smith, St Mary's College (emeritus)

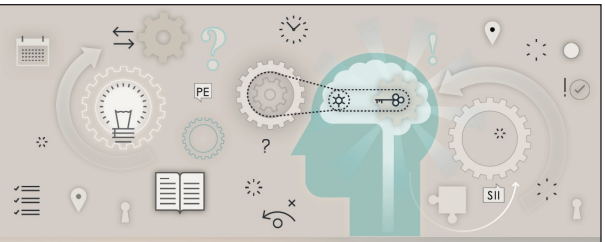
Member at Large: Arlene King-Berry, University of the District of Columbia

Member at Large: Josh Hill, Middle Georgia State University

Member at Large: Ingrid Ulbrich, Colorado State University

Member at Large: Chaya Jain, Virginia State University

ACADEMY of Process Educators



WELCOME FROM THE ACADEMY OF PROCESS EDUCATORS

Welcome to the 11th Annual Process Education Conference on behalf of the Academy of Process Educators. We are thrilled to have you here as part of a community of educators committed to empowering learners. This year our focus is on Generation Z, the iGens, who have been dubbed the social media generation.

The conference is organized to facilitate collaboration and engagement. From symposia that draw together attendees to hear leading national, institutional and classroom experts that will share their views, to break-out sessions in smaller groups with research and practitioner workshops that share learning strategies and explore key research questions, this conference invites attendees to actively reflect on the nature of our incoming college students, Generation Z. This conference is also about teaching and learning strategies for those of us from other generations who want to bridge generational differences.

Please participate fully in the scheduled symposia, paper sessions, workshops, social activities and networking opportunities. Visit the Hall of Innovation. Make friendships and establish research collaborations that may last a lifetime.

Mary C. Moore

2018 President, Board of Academy of Process Educators

www.processeducation.org

a 501(c) corporation

GANNON UNIVERSITY

Vice President for Academic Affairs
109 University Square
Erie, Pennsylvania 16541-0001
(814) 871.7401 • fax (814) 871.5889
www.gannon.edu

June 14, 2018

Dear Process Educators:

It is my pleasure to welcome you to Gannon University! I hope you will enjoy your stay on our campus and in the City of Erie. Your venue for the conference, our Center for Business Ingenuity, is located in the center of Erie's business district and houses the Dahlkemper School of Business, Erie Technology Incubator, and the Small Business Development Center at Gannon University. Offices for the College of Engineering and Business are also located in the building. I would especially like to invite you to visit our recently renovated Nash Library, which we see as a model library for the 21st century. The Nash Library is located at 4th and Sassafras Streets – diagonally across from Harborview apartments, where many of you are staying.

The City of Erie has many great restaurants and entertainment venues. You can find many different cuisines right here in our downtown. Downtown we have the Warner Theater, a restored art deco theater, the Erie Community Playhouse, and the Erie Insurance Arena. Unfortunately, our professional baseball team – the Erie Seawolves – are traveling this week and won't be playing in UPMC Field, which is only a block from your conference. Erie boasts the nation's premier freshwater beaches at Presque Isle State Park, as well as Waldameer amusement and waterpark.

I would also like to congratulate the members of the Academy celebrating 25 years of process education. Process education brings new learning opportunities to students and helpful assessment to both students and faculty.

I hope you will have a great conference and wish you safe travels home.

Yours Truly,

Walter Iwanenko Jr., Ph.D.
Vice President for Academic Affairs
Gannon University

Welcome from the Conference Committee

We are excited to have you join us around our 2018 conference theme 'Generation Z (iGen): The Social Media Generation'. In 2016 we celebrated 25 years of Process Education. The past 25 years brought profound changes in our students. Generation X gave way to the Millennials. Now the Millennials are exiting their college years and Generation Z (iGen) is entering. The 2018 conference will leverage opportunities to empower students for better academic success through application of PE principles, but in a way that respects emerging values, different perspectives, and unfolding social fads as well as societal changes. We hope you will engage deeply and meaningfully with other process educators to help realize personal as well as shared conference goals.

PROCESS EDUCATORS...

…trust and respect students and are willing to shift control of their learning to them. These educators want to see growth in others and strive to foster their own self-growth. They can handle change and are willing to innovate and experiment. Because assessment is the best way to improve performance, they enjoy it, seek it, and practice it.

CONFERENCE GOALS

1. Develop shared understanding of academic risk factors and success factors possessed by typical Generation Z students.
2. Share innovations for engaging and relating with Millennials and Generation Z in and out of the Classroom.
3. Explore strategies for integrating Service Learning in course and program design, aligning with an important Generation Z social value.
4. Incubate research activity about the use and effects of social media in collegiate learning.
5. Effectively use instructional technology in conference design/delivery, providing a model for deploying synchronous as well as asynchronous learning in our classrooms.

CONFERENCE THREADS

1. A **pre-conference workshop** to introduce/review added value of Process Education teaching/learning in a collegiate setting.
2. **Symposium sessions** where panels will share expertise around classroom-level, institution-level, and national-level iGen teaching/learning programs and themes.
3. **Keynote sessions** where nationally recognized leaders in iGen teaching/learning will share their visions, innovations, and outcomes.
4. **Hall of Innovation** poster session where each attendee can share a personal best practice or teaching/learning discovery that is aligned with teaching next generation students.
5. **Practitioner workshops** where participants will engage in interactive learning activities that explore and disseminate best practices in teaching/learning.
6. **Researcher workshops** where participants can better understand and become more engaged in the scholarship behind specific teaching/learning methods and tools.
7. **Community workshops** where participants can learn to access Academy resources, engage with other members, and formulate shared goals for current and future teaching/learning activities.

Your 2018 Conference Committee

Program Design & Presenter Recruiting – Daniel Apple, Pacific Crest

Program Design & Session Submissions – Steve Beyerlein, University of Idaho

Program Notebook Compilation – Cynthia Woodbridge, Georgia Gwinnett College

Program Notebook Editing – Marie Baehr, Coe College

Conference Website & Program Notebook Formatting – Denna Hintze, educational consultant

Online Conference Arrangements – Matt Watts, Tidewater Community College

Local Campus Host – WL Scheller, Gannon University

Mentor of mentors – Will Ofstad, California Health Sciences University

Recruiting Coordinator – Sean Quallen, University of Idaho

Registration – Peter Smith, St. Mary's College (emeritus)

Awards – Joyce Adams, Hinds Community College

Symposium 1 Facilitator – Audrey Murray, Hinds Community College

Symposium 2 Facilitator – Mary Moore, University of Indianapolis

Symposium 3 Facilitator – Wade Ellis, West Valley College (emeritus)

Student Session Organizer – Shawn Clerkin, Gannon University

Conference Assessment – Tris Utschig, Kennesaw State University

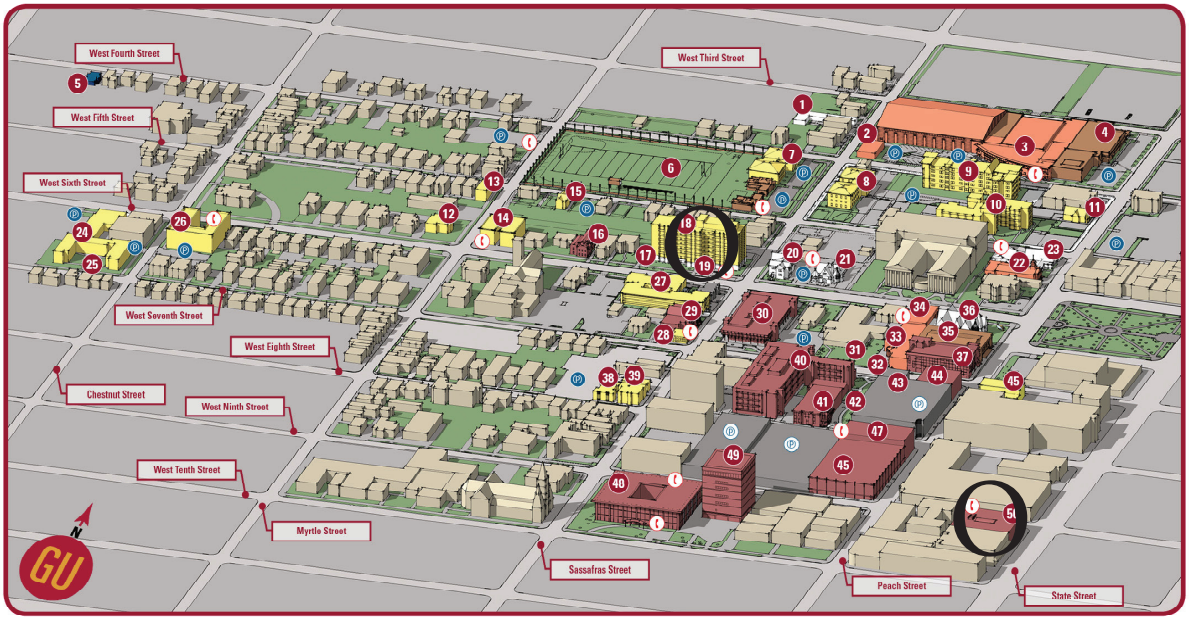
Hall of Innovation Coordinator – Priscilla Burks, Hinds Community College

Session Recording – Dan Litynski, Western Michigan University

Winery Tour – Mark Terrell, LECOM

Academy Board Liaison – Mary Moore, University of Indianapolis

GANNON UNIVERSITY
CAMPUS MAP



ADMINISTRATION
37 Admissions- Global (International)
21 Admissions- Graduate
20 Admissions- Undergraduate
17 Campus Police & Safety
43 Campus Services
21 Cashier
21 Courthouse Commons
50 Erie Technology Incubator (ETI)
20 Gitnik Manse
23 Human Resources
36 Old Main
1 Physical Plant
21 Registrar
50 Small Business Development Center (SBDC)

STUDENT SERVICES
19 Health & Counseling Services
2 The Knight Club
34 Keim Commons
22 Mary, Seat of Wisdom Chapel
3 Recreation & Wellness Center
23 Student Services Building
47 University Bookstore
33 Waldron Campus Center

ACADEMIC
46 A.J. Palumbo Academic Center
37 Beyer Hall
41 Center for Advanced Engineering
50 Center for Business Ingenuity
44 Center for Communication and the Arts
16 Forensic Investigation Center
49 Knight Tower
30 Nash Library
48 Robert H. Morosky Academic Center
29 Schuster Theatre/Scottino Hall
40 Zurn Science Center

ATHLETIC FACILITIES
4 Carneval Athletic Pavilion
35 Hammermill Center
6 McConnell Family Stadium

LANDMARKS
42 AJ's Way
31 Friendship Green
32 Gannon Arch

Gannon Assigned Parking
Public Parking

COMMUNITY
25 Gannon Goodwill Garden
5 St. Joseph House of Faith in Action

RESIDENCE
13 301 & 305 W. Fifth St. Apartments
28 632 Sassafras
15 Alpha Sigma Tau House
12 Bishop Donald W. Trautman House
11 Delta Kappa Epsilon House
10 Finegan Hall
7 Freeman Hall
18 Harborview Apartments
26 Kenilworth Apartments
8 Lubiak Apartments
9 North Hall
39 Phi Sigma Sigma House
45 Walker Building
27 Wehrle Hall
38 W. Eighth St. Apartments
24 West Hall
14 Wickford Apartments

Emergency Call Box

PE Conference 2018 Master Schedule

Note that ALL conference sessions will be held in the *Center for Business Ingenuity*.
Location designates the **specific room or area**.

Time	Location	Activity
Wednesday June 13		
6:30 pm	TBA	**Research & Publication Networking Dinner** (Facilitator, David Leasure)
Thursday June 14		
7:30 am	Lobby	Registration & Material Pick-up
8:00 am	Lobby	Welcome and Conference Overview
8:15 am	Lobby	**Team Time** (Facilitator, Will Ofstad)
8:45 am	Lobby	**Symposium 1: Classroom Practices for Engaging i-Generation Students** (Facilitator, Audrey Murray)
10:15 am	Lobby	Break
10:45 am	**Parallel Sessions**	
	010	**Universal Performance Power** (David Leasure)
	205 (BISL)	**The "Why" and "How" of Implementing Team-Based Homework** (Dan Cordon, Sean Quallen)
	300	**Papers: Risk/Success Factors for iGen Students** (Joann Horton)
12:00 pm	Lobby	Lunch
1:00 pm	Lobby	**Keynote 1: Generation Z: An Inside Perspective** (Speaker, Breanna Apple)
1:45 pm	Lobby	Break
2:00 pm	Lower Level Atrium	**Hall of Innovation** (Facilitator, Priscilla Burks)
3:30 pm	Lobby	Break
4:00 pm	**Parallel Sessions**	
	300	**Top 10 i-Gen Tools for Teaching/Learning** (Breanna Apple)
	205 (BISL)	**Papers: Sharing Teaching/Learning Innovations with iGen** (Matthew Watts)
	010	**Faculty Performance: How to define and measure quality in Teaching and Learning** (Mark Terrell)
5:30 pm	Lobby	Team Time
6:15 pm		Adjourn

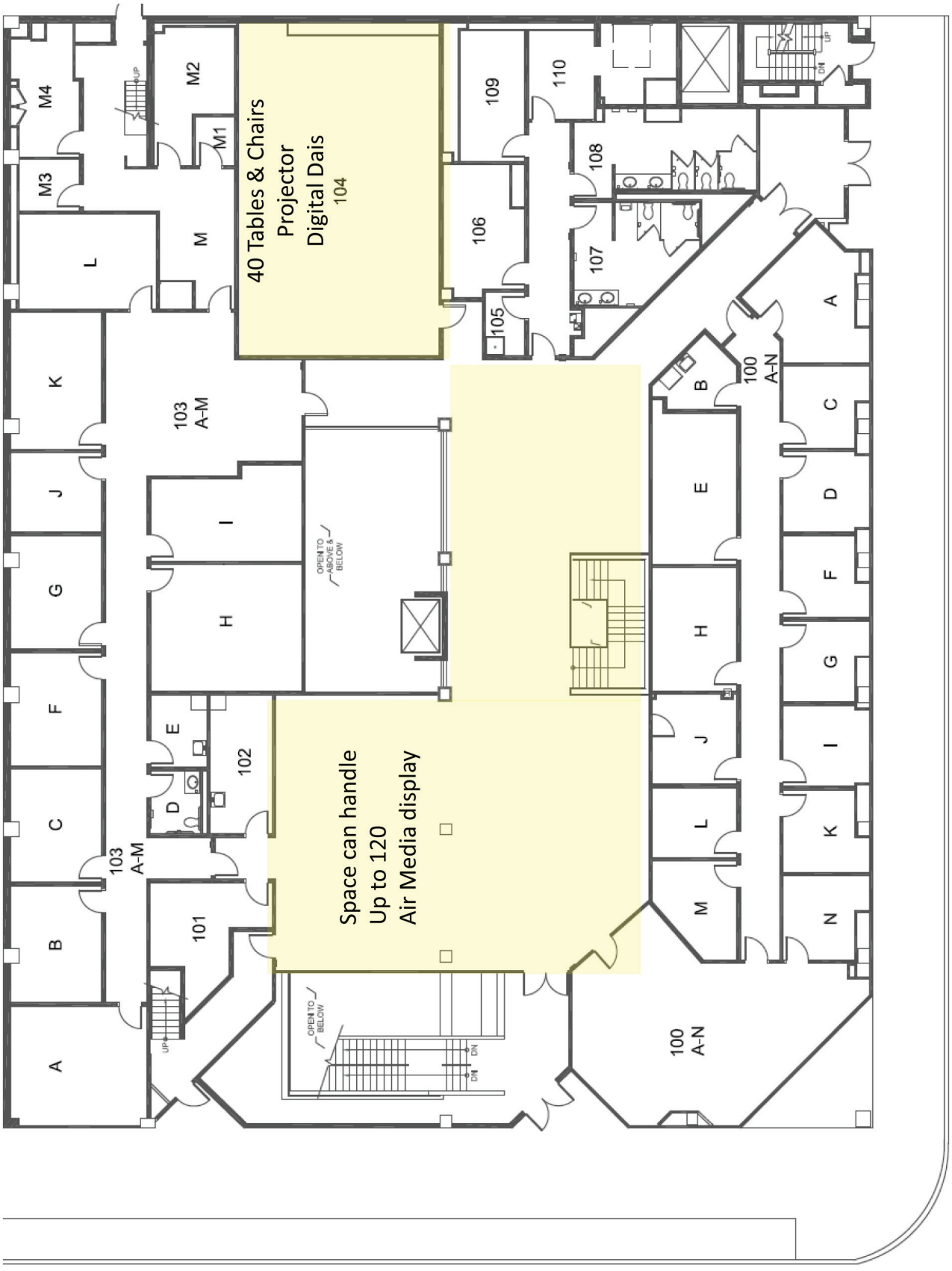
Time	Location	Activity
6:30 pm		Winery Visit and Tour
Friday June 15		
8:00 am	Lobby	Team Time
8:30 am	Lobby	**Symposium 2: Institutional Practices for Engaging i-Generation Students** (Facilitator, Mary Moore)
10:15 am	Lobby	Break
10:45 am	**Parallel Sessions**	
	205	**Using Self-Growth Papers as a Qualitative Research Tool to Study Transformational Learning** (Wade Ellis)
	300	**Specifications Grading** (Cynthia Woodbridge, Angi Lively)
	010	**Papers: Learning to Learn STEM** (Raj Chaudhury)
12:15 pm	Lobby	Lunch
1:00 pm	Lobby	**Keynote 2: Role of the Academy in the iGen Age (**Speaker, Matthew Watts)
1:45 pm	Lobby	Break
2:00 pm	**Parallel Sessions**	
	205 (BISL)	**iGens and the Rest of Us** (Mary Moore, Ken Colburn)
	300	**Deliberately Developmental Organizations** (Wendy Duncan)
	010	**Papers: Service Learning and Outreach** (Shawn Clerkin)
3:30 pm	Lobby	Break
4:00 pm	**Parallel Sessions**	
	205 (BISL)	**Researching the Recovery Course** (Dan Apple)
	300	**Teaching Critical Thinking** (Joann Horton)
	010	**Papers: Learning Sciences (**Sean Quallen)
5:30 pm	Lobby	Team Time
6:15 pm		Adjourn
7:00 pm		Academy Social @ VooDoo Brewery & Restaurant
Saturday June 16		
7:45 am	205 (BISL)	**Academy Business Meeting** / Election of Officers
8:30 am	Lobby	Team Time
9:00 am	Lobby	**Symposium 3: International Initiatives for Increasing i-Generation Student Success (**Facilitator, Wade Ellis)

Time	Location	Activity
10:30 am	Lobby	Break
11:00 am	**Parallel Sessions**	
	Lobby	**Academy Operational Planning** (Matthew Watts)
	300	**Comparing Profiles of Current vs Required College Readiness** (Arlene King-Berry)
12:30 pm	Lobby	Lunch
1:15 pm	Lobby	**Plenary Session: Needs and Assets of this Generation of Students** (Facilitator, Shawn Clerkin)
2:30 pm	Lobby	Team Time and Team Reports
4:00 pm	Lobby	Awards Ceremony (Joyce Adams)
4:15 pm	Lobby	**Conference Assessment** (Tris Utschig)
5:00 pm	Lobby	Adjourn
5:15 pm	205 (BISL)	**Academy Board Meeting**
Sunday June 17		
8:00 am	300	**Academy Research Strategy and Mission** (Facilitator, David Leasure)
8:15 am	300	**Review Research Opportunities** (Facilitator, David Leasure)
8:35 am	300	Re-seat according to interest and get to know your group
8:45 am	300	Identify research/publication projects of interest
9:15 am	300	Break: Review forum postings over break; re-align with new groups if desired
9:30 am	300	Use PSM to define your table's interests. Focus on steps 1-2
10:30 am	300	Brief the group on your table's top interest
10:40 am	300	Continue working with your group on PSM steps 3-5
11:10 am	300	Develop project plan for your group. Post to forum.
11:45 am	300	SII Assessment of group work
12:00 pm	300	Adjourn

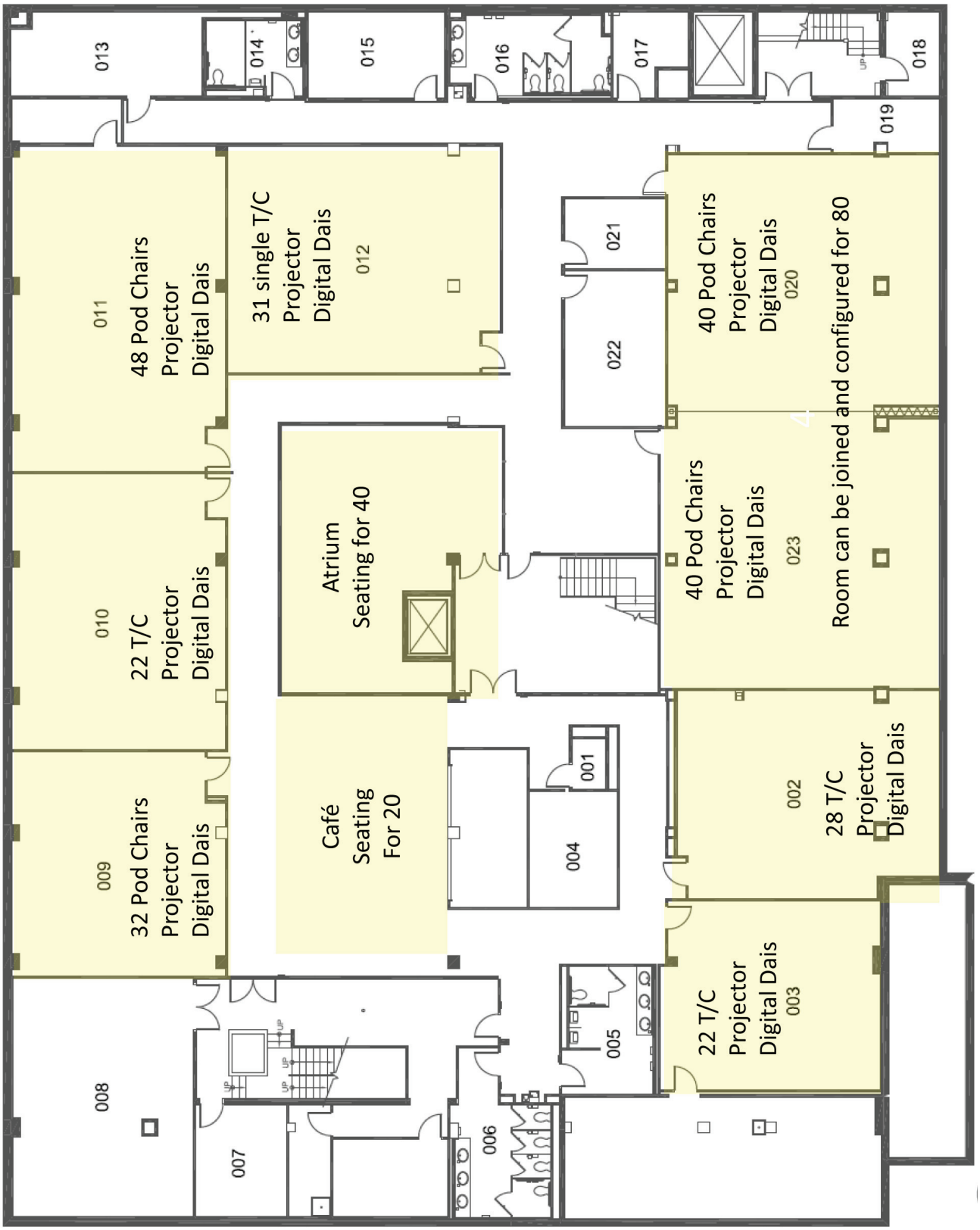
Notes:

- CBI 104 will be available for personal items which need to be secured when the Lobby is not in use for a session.
- CBI 201 will be available for conference organizers as a room for any impromptu meetings.
- CBI 102 is the kitchen for staging food for meals and break snacks.
- Zoom in BISL uses wall mounted camera and touchpad screens. Side screens can display from a mobile device

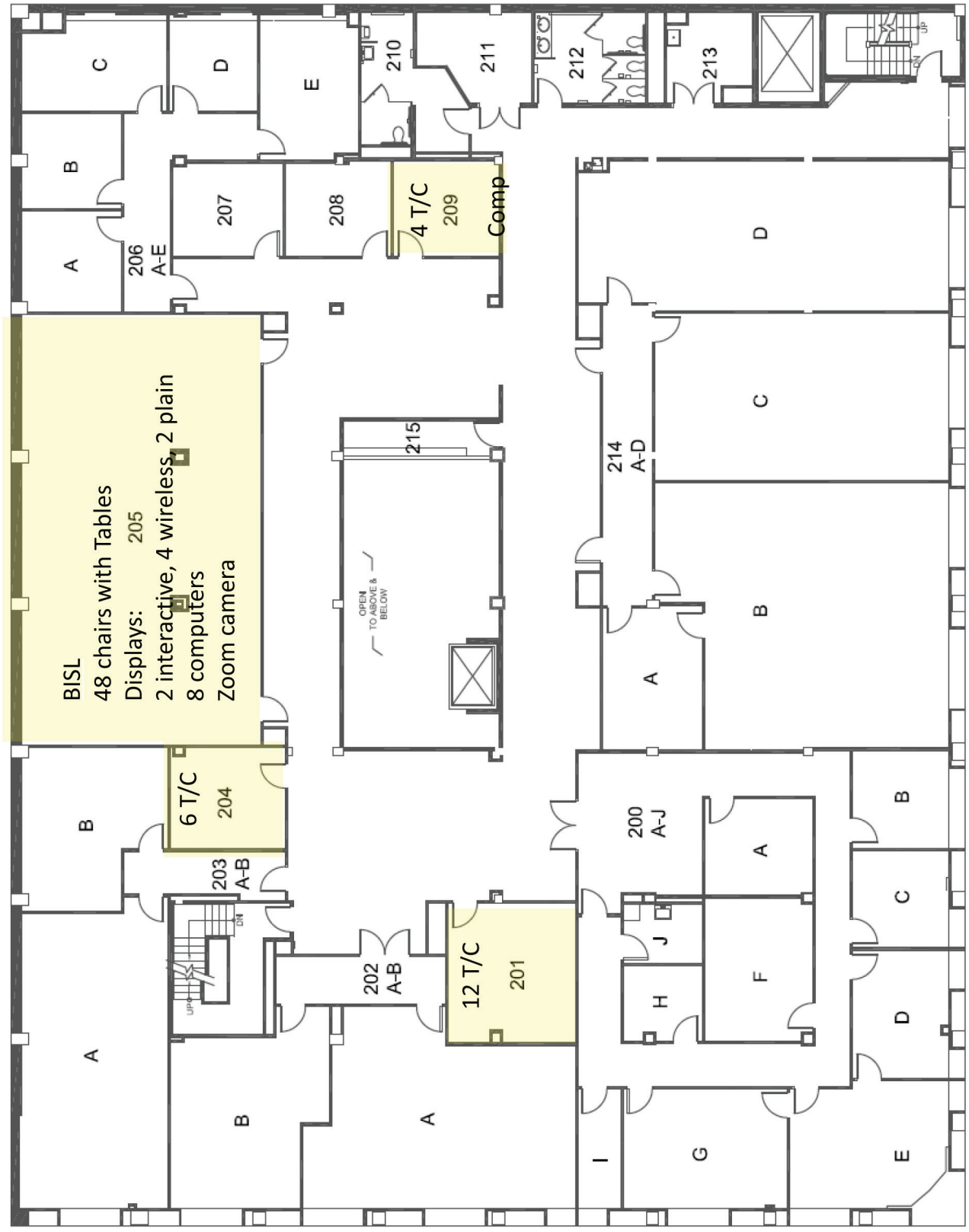
CBI Floor Plan: First Floor



CBI Floor Plan: Lower Level

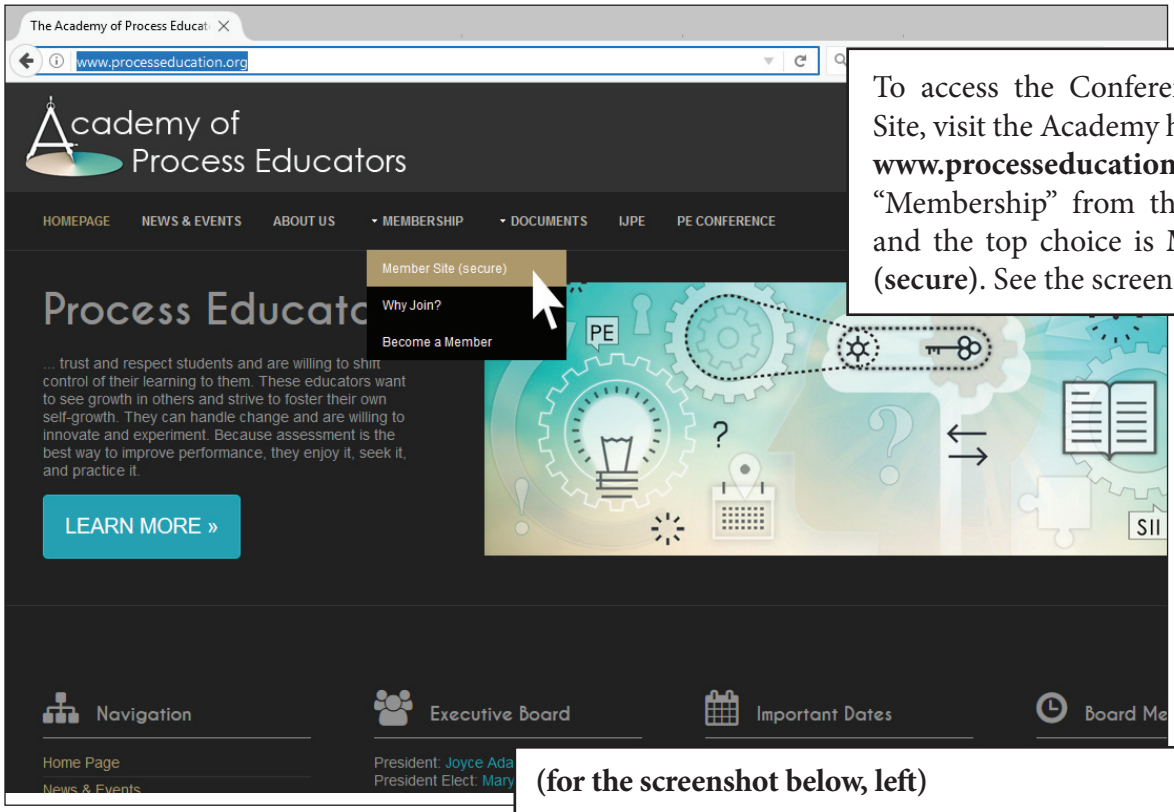


CBI Floor Plan: Second Floor



CBI Floor Plan: Third Floor

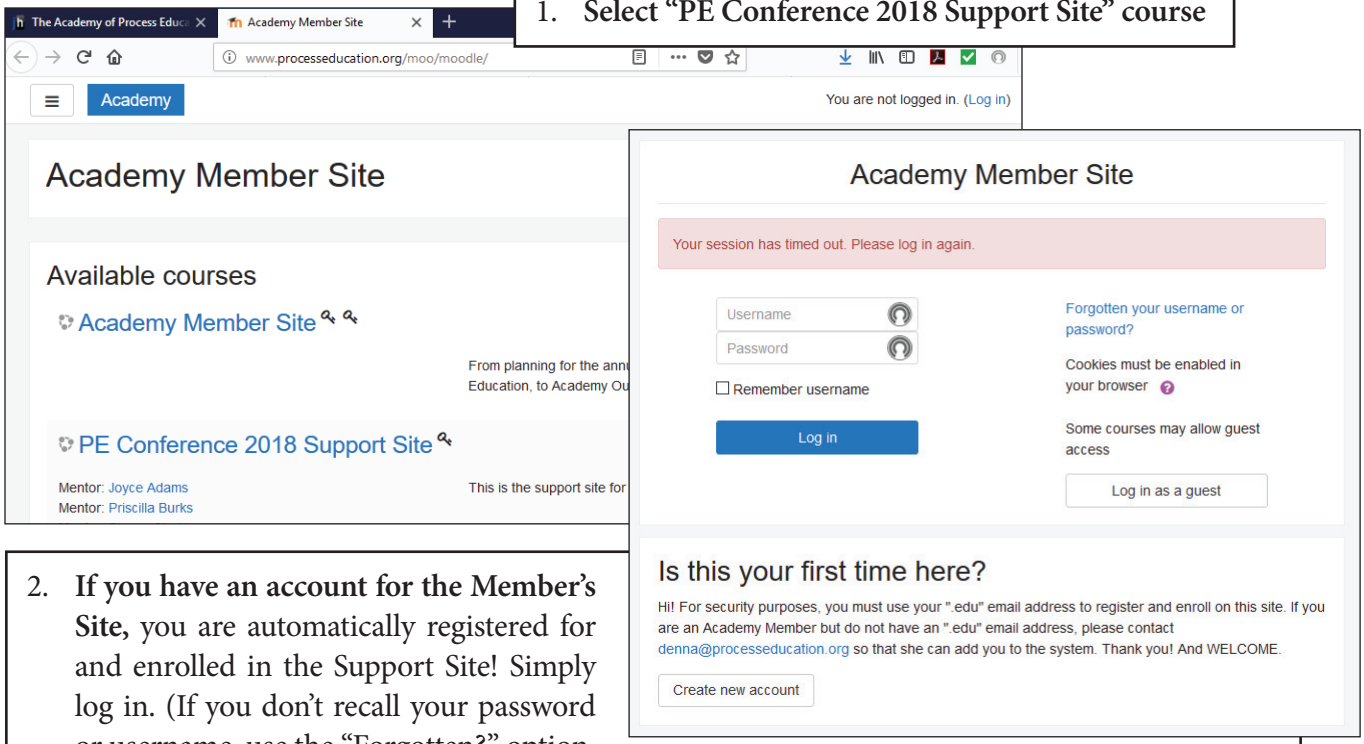
Accessing the Conference Support Site



To access the Conference Support Site, visit the Academy home page at **www.processeducation.org** Select "Membership" from the top menu and the top choice is **Member site (secure)**. See the screenshot at left.

(for the screenshot below, left)

1. **Select "PE Conference 2018 Support Site" course**



2. **If you have an account for the Member's Site,** you are automatically registered for and enrolled in the Support Site! Simply log in. (If you don't recall your password or username, use the "Forgotten?" option.
3. **If you have never accessed the Academy website and did not receive log in information for the Support Site by email,** use the "Create new account" option. Your email MUST end in ".edu". Once you have created your account, select the "PE Conference 2018 Support Site" from "Site Home". Enroll yourself for that course. Use enrollment key: **pe4me**

PE Conference 2018 Session Assessment Form

Session Title	Facilitator

Ratings

Item	**(1 = least/worst, 10 = most/best)** 1	2	3	4	5	6	7	8	9	10
Quality of materials used for the event	○	○	○	○	○	○	○	○	○	○
Quality of facilitation/presentation	○	○	○	○	○	○	○	○	○	○
Ease of use of technology	○	○	○	○	○	○	○	○	○	○
Degree to which expectations were met	○	○	○	○	○	○	○	○	○	○
Interest in continuing to learn about this topic	○	○	○	○	○	○	○	○	○	○

Session SII

STRENGTHS for each, ***name*** it, give ***evidence*** for it, explain ***why it was important*** to session quality
AREAS FOR IMPROVEMENT for each, ***name*** it, ***explain*** the concern & describe ***how to eliminate*** it
INSIGHTS for each, please ***describe*** a realization or connection you made, ***explain its significance***
Additional comments or feedback

Notes

PE Conference 2018 Session Assessment Form

Session Title	Facilitator

Ratings

Item	**(1 = least/worst, 10 = most/best)** 1	2	3	4	5	6	7	8	9	10
Quality of materials used for the event	○	○	○	○	○	○	○	○	○	○
Quality of facilitation/presentation	○	○	○	○	○	○	○	○	○	○
Ease of use of technology	○	○	○	○	○	○	○	○	○	○
Degree to which expectations were met	○	○	○	○	○	○	○	○	○	○
Interest in continuing to learn about this topic	○	○	○	○	○	○	○	○	○	○

Session SII

STRENGTHS for each, ***name*** it, give ***evidence*** for it, explain ***why it was important*** to session quality
AREAS FOR IMPROVEMENT for each, ***name*** it, ***explain*** the concern & describe ***how to eliminate*** it
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PE Conference 2018 Session Assessment Form

Session Title	Facilitator

Ratings

(1 = least/worst, 10 = most/best)

Item	1	2	3	4	5	6	7	8	9	10
Quality of materials used for the event	○	○	○	○	○	○	○	○	○	○
Quality of facilitation/presentation	○	○	○	○	○	○	○	○	○	○
Ease of use of technology	○	○	○	○	○	○	○	○	○	○
Degree to which expectations were met	○	○	○	○	○	○	○	○	○	○
Interest in continuing to learn about this topic	○	○	○	○	○	○	○	○	○	○

Session SII

STRENGTHS for each, ***name*** it, give ***evidence*** for it, explain ***why it was important*** to session quality
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PE Conference 2018 Session Assessment Form

Session Title	Facilitator

Ratings

Item	**(1 = least/worst, 10 = most/best)** 1	2	3	4	5	6	7	8	9	10
Quality of materials used for the event	○	○	○	○	○	○	○	○	○	○
Quality of facilitation/presentation	○	○	○	○	○	○	○	○	○	○
Ease of use of technology	○	○	○	○	○	○	○	○	○	○
Degree to which expectations were met	○	○	○	○	○	○	○	○	○	○
Interest in continuing to learn about this topic	○	○	○	○	○	○	○	○	○	○

Session SII

STRENGTHS for each, ***name*** it, give ***evidence*** for it, explain ***why it was important*** to session quality
AREAS FOR IMPROVEMENT for each, ***name*** it, ***explain*** the concern & describe ***how to eliminate*** it
INSIGHTS for each, please ***describe*** a realization or connection you made, ***explain its significance***
Additional comments or feedback

Notes

PE Conference 2018 Conference Assessment Form

Overall Conference Ratings

Item	(1 = least/worst, 10 = most/best) 1	2	3	4	5	6	7	8	9	10
Quality of materials used for the event	○	○	○	○	○	○	○	○	○	○
Quality of facilitation/presentation	○	○	○	○	○	○	○	○	○	○
Ease of use of technology	○	○	○	○	○	○	○	○	○	○
Degree to which expectations were met for:	○	○	○	○	○	○	○	○	○	○
Symposium sessions	○	○	○	○	○	○	○	○	○	○
Keynote sessions	○	○	○	○	○	○	○	○	○	○
Workshop sessions	○	○	○	○	○	○	○	○	○	○
Research sessions	○	○	○	○	○	○	○	○	○	○
Community sessions	○	○	○	○	○	○	○	○	○	○
Hall of Innovation Poster session	○	○	○	○	○	○	○	○	○	○
Mentoring program	○	○	○	○	○	○	○	○	○	○
Overall	○	○	○	○	○	○	○	○	○	○
Interest in learning more about Process Education	○	○	○	○	○	○	○	○	○	○

Conference goals: To what degree was this conference able to:

Item	(1 = least/worst, 10 = most/best) 1	2	3	4	5	6	7	8	9	10
1. Provide a model for advancing equity through empowerment of the participants so they can return home to empower their home institutions to better empower their students for personal/academic/professional success	○	○	○	○	○	○	○	○	○	○
2. Incubate research activities and publications that will propagate research based-practices central to Process Education	○	○	○	○	○	○	○	○	○	○
3. Inspire and inform participants how to teach learning to learn and self-growth	○	○	○	○	○	○	○	○	○	○
4. Expand and strengthen the community of Process Educators who want to meet annually at the conference to advance all aspects of Process Education practice and research in their role as facilitators of teaching/learning/scholarship	○	○	○	○	○	○	○	○	○	○

Conference Connecting Events: *Pre-conference workshop*

Did you participate in the pre-conference workshop?

If YES:	(1 = least/worst, 10 = most/best) 1	2	3	4	5	6	7	8	9	10
To what degree did the conference synergistically connect with the pre-conference workshop?	○	○	○	○	○	○	○	○	○	○
To what degree would you like to continue exploring the pre-conference workshop topic?	○	○	○	○	○	○	○	○	○	○

Conference SII

STRENGTHS for each, ***name*** it, give ***evidence*** for it, explain ***why it was important*** to quality
AREAS FOR IMPROVEMENT for each, ***name*** it, ***explain*** the concern & describe ***how to eliminate*** it
INSIGHTS for each, please ***describe*** a realization or connection you made, ***explain its significance***
Additional comments or feedback

2018 Conference Attendees

(Registered as of 1 June, 2018)

Last name	First name	Position	Institution	Email
Adams	Jessica		University of Rhode Island	
Adams	Joyce	Related Studies Inst. - Nursing/Developmental Ed	Hinds CC NAHC	jbadams@hindscc.edu
Aoh	Quyen	Assistant Professor of Biology	Gannon University	aoh001@gannon.edu
Apple	Dan	President	Pacific Crest	dan@pcrest.com
Apple	Breanna	Student	Renselaer Polytechnic Institute	appleb@rpi.edu
Baca-Radler	Therese	Faculty/University College	University of New Mexico	tbaca3@unm.edu
Baehr	Marie	Vice President of Academic Affairs	Coe College	mbaehr@coe.edu
Barnhizer	Stephanie	Instructor of Philosophy	Gannon University	barnhize001@gannon.edu
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Notes

THURSDAY
JUNE 14, 2018

Section 2

Session Legend

 Keynote/Plenary
 Symposium
 Workshop
 Distance Workshop
 Poster Session
 Teams/Groups
 Meeting
 Special Event
 Break
 Lunch/Meal

Time		Session Information	Where	Page
7:30 am		Registration & Material Pick-up	Lobby	
8:00 am		Welcome and Conference Overview	Lobby	
8:15 am		**Conference Mentoring and Team Programming** (Facilitator, Will Ofstad)	Lobby	2-3
8:45 am		**Symposium 1: Classroom Practices for Engaging i-Generation Students** (Facilitator, Audrey Murray)	Lobby	2-11
10:15 am		**Break**	Lobby	
10:45 am	**Parallel Sessions**			
		**Universal Performance Power** (David Leasure)	010	2-23
		**The "Why" and "How" of Implementing Team-Based Homework** (Dan Cordon, Sean Quallen)	205 (BISL)	2-33
		**Papers: Risk/Success Factors for iGen Students** (Joann Horton)	300	2-35
12:00 pm		**Lunch**	Lobby	
1:00 pm		**Keynote 1: Generation Z: An Inside Perspective** (Speaker, Breanna Apple)	Lobby	2-63
1:45 pm		**Break**	Lobby	
2:00 pm		**Hall of Innovation** (Facilitator, Patricia Burks)	Lower Level Atrium	
3:30 pm		**Break**	Lobby	

Time		Session Information	Where	Page
4:00 pm	**Parallel Sessions**			
		**Top 10 i-Gen Tools for Teaching/Learning** (Breanna Apple)	300	2-65
		**Papers: Sharing Teaching/Learning Innovations with iGen** (Matthew Watts)	205 (BISL)	2-67
		**Faculty Performance: How to define and measure quality in Teaching and Learning** (Mark Terrell)	010	2-83
5:30 pm		**Team Reflection**	Lobby	2-85
6:15 pm		**Adjourn**		
6:30 pm		**Winery Visit and Tour**		2-87

Conference Mentoring and Team Programming

CBI Lobby
8:15am

Facilitator: Will Ofstad

http://www.processeducation.org/moo/moodle/course/view.php?id=2#section-1

OVERVIEW

Conference attendees often come to academic conferences – as engaged learners come to class – with the hope of learning something new and interesting. We have structured this conference using Process Education principles to improve the conference performance for the attendees (learners) by helping set goals and providing team-based learning experiences to work toward those goals. Thus, the conference will be more like a series of mini-Professional Development and Research experiences using standard Process Education and Team-Based Learning techniques, tools, and practices.

CONFERENCE MENTORING SYSTEM

At this year's conference we will be having Team-Based Learning with Mentors assigned to each team. This year there will be 10 onsite teams and 2 online teams, with all conference attendees assigned to one of these teams. The Mentoring System will be supervised by Will Ofstad who is the title Mentor of Mentors. The mentors this year include Joann Horton, Mary Moore, Joyce Adams, Cynthia Woodbridge, Wade Ellis, David Leasure, Audrey Murray, Priscilla Burks, Dan Cordon, Sean Quallen, Betty Hurley, and Matt Watts. Betty and Matt will be associated with the online teams. Mentor roles are clarified through the following performance criteria.

Each Mentor…

1. Has a very strong belief in each team member's potential for success, conveys this clearly to each participant consistently, and shares personal experiences and results of previous conference attendee's successes.
2. Is a very **caring individual who connects** with their mentees and expresses this caring in a productive and meaningful way by putting participants' interests first.
3. Consistently **self-assesses** their own performance, learns and grows from past performances so future performances continue to improve.
4. Continuously **models a set of productive behaviors** that participants can emulate and uses language of success that produces an environment of productive growth.
5. **Mentors** the growth and development of their participants for the empowerment of their learning skills and provide numerous opportunities for learners to do for themselves.
6. Puts out extra effort to **reach out to participants** who are having difficulties and brings them back into the process when the participants might leave or withdraw otherwise.
7. **Facilitates** an enriched learning environment where there is a strong shared commitment, adventurous risk taking with temporary failure, high expectations, quality assessment, documented growth, and appropriate increasing challenges.
8. Constantly **focuses on** true learning through **critical thinking** rather than learning by just listening and memorizing informational knowledge.

CONFERENCE MENTORING SYSTEM (con't)

9. Takes **responsibility for** the performance and **success** of their learning team.
10. **Supports** other coaches assigned to their **community**.
11. Helps to **motivate, counsel, and give quality feedback** to grow the performance of their learning team.

COOPERATIVE LEARNING TEAMS

At the heart of a quality Learning to Learn (Process Education) environment is the use of cooperative learning and team-based learning supported by a mentoring process. With this in mind (in addition to the standard program structure), this conference provides learning experiences for teams with 5 to 7 participants and assigned mentors. At the beginning and end of each day, we have allocated space in the schedule for participants to share learning plans as well as discoveries related to both personal and team goals. You should have learned about your team assignment in an email before for the conference. Team assignments for all participants are summarized in a handout associated with this session.

Teamwork relies on building trust, sharing a plan and expectations, and giving permission to peers to give and receive feedback. Once teams are formed (in this case, in a manner that diversifies years involved with Process Education), there tends to be a natural progression through storming (lack of safety, agreement or feedback) and norming (agreeing on process and expectations) that teams must work through to reach high performance. Use of team roles, creating a team contract early, creating team goals and reflecting on team performance all support more rapid progression to high performance.

MENTORSHIP OUTCOMES FOR TEAM-BASED LEARNING SESSIONS

- Establish and maintain a Quality Learning Environment
- Create an atmosphere of self and peer accountability for readiness
- Shifting culture from processing information rather than transferring information
- Produce and reflect on team contract, team goals and team learning outcomes
- Capture the knowledge and research efforts on the Moodle site
- Coordinate a presentation of team learning and research over the entire conference in a concluding gallery walk

Team Contracting and Goal Setting

Facilitator: Will Ofstad, California Health Sciences University

OVERVIEW

At the beginning of any learning experience (the conference), we want learners to create a team contract and produce their own learning goals and associated outcomes to target their efforts to maximize the quality of outcomes.

PLAN

Readiness:

- Each team member brings three personal goals for the conference and associated outcomes that describe what meeting the goal looks like. Outcomes should be SMART (specific, measurable, attainable, relevant to you, and time limited). Bring these in writing to help clarify your goals and also to show your teammates you came prepared. You will turn these in to your team mentor.
- All team members review the team contract worksheet in advance (to speed up the contracting process).

Application:

1) [5 minutes] Sit with and welcome your team members. Introduce yourselves and share contact information (so you can reach one another during the conference).
2) [5 minutes] Decide on a team name and create a nice placard for your team table. Assign team roles (see mentor if you are unfamiliar with typical Process Education team roles).
3) [3 minutes per person] Share personal goals and outcomes with the rest of your team. Feel free to improve on your goals and outcomes as you discuss. *Turn in your written individual goals and outcomes to your mentor by end of Day 1.*
4) [20 minutes] As a team, complete the team contract worksheet. *Due to your mentor by the end of Day 1.*
5) [15 minutes] As a team, synthesize three team goals and associated SMART outcomes for the conference. Be sure to explicitly describe why each goal matters. Consider how each goal aligns to the theme of the conference.
6) [10 minutes]
   - The recorder for the team posts team goals in two places: (1) on the wall using a large-scale sticky note and (2) under your team thread on the PE Conference Site.

     http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=103

   - Individually, record your finalized personal goals and outcomes under your team thread on the PE Conference Site.

Application time: 1 hour 10 minutes. Remaining buffer time 20 minutes (including eating lunch).

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=104

7) Sample Goal Posting by Recorder

Goal	Description of Goal	Associated SMART Outcomes
Goal 1 in brief	Narrative, including why it matters.	Ensure each outcome is specific, measurable, attainable, relevant to the team and conference, and time limited.
Goal 2 in brief	Narrative, including why it matters.	Ensure each outcome is specific, measurable, attainable, relevant to the team and conference, and time limited.
Goal 3 in brief	Narrative, including why it matters.	Ensure each outcome is specific, measurable, attainable, relevant to the team and conference, and time limited.

Team Contract

"Great things in business are never done by one person, they're done by a team of people" –Steve Jobs

Step 1: Reflection on Past Teams

Everyone has worked in groups, often with variable levels of success. High performing teams develop trust, work for common goals, and check-in and help one another to stay ahead of problems.

Take 10 to 15 minutes to share your past experience working on teams, and document examples of what has worked well and what could be better. Focus on team process, rather than individual members.

Past examples of effective teamwork *and include why it worked*	**Past examples of ineffective teamwork** *what processes needed to change*

Past examples of effective teamwork *and include why it worked*	**Past examples of ineffective teamwork** *what processes needed to change*

"Coming together is a beginning. Keeping together is progress. Working together is success." –Henry Ford

Step 2: Select Team Rules

Prepare a set of team rules to help your team work well together, keeping in mind past experiences with teams above. Each member agrees to be held accountable by peers for these rules so select carefully.

- If there is disagreement, discuss and then vote. A vote of most members (at least two-thirds) is needed to enact a rule.

Below are sample team rules prepared by past teams. You may check the rules that your team would like to adopt, or prepare your own set of rules.

Communication

- ☐ Respect and value other member's opinions and input, even if it differs from your own.
- ☐ Present yourself respectfully and professionally, especially when there is potential for conflict.
- ☐ Be willing to talk about team dynamics.
- ☐ Be truthful and share openly.
- ☐ Provide eye contact when speaking.
- ☐ Keep in touch outside of class.
- ☐ Respond to emails, texts, or calls ASAP, no later than 24 hours.

Unity

- ☐ *(circle one)* M T W Th F is snack day and team spirit day. Bring something to share.
- ☐ Laughter and joking on a daily basis is required.
- ☐ If one member falls behind, all other members help to catch that person up.
- ☐ Whoever excels on a project gets treated to celebratory outing by the rest of the team.
- ☐ Don't let personal relationships interfere with the team (e.g. dating, fraternity, past problems).
- ☐ Be united and supportive (in and out of class).
- ☐ Be positive when solving problems.
- ☐ Thank others for help and good work.

Work Quality

- ☐ Develop timeline for all group projects within one week of date assigned.
- ☐ Submit all work/materials in on time. Let team know well in advance if you are falling behind.
- ☐ Be prepared: do your reading and preparation.
- ☐ Work honestly: don't cheat, plagiarize, or expose the team to disciplinary action.
- ☐ Take on a fair share of team projects.
- ☐ Take responsibility for reading and giving feedback for the final team product before submission.
- ☐ Take responsibility for your own mistakes and take steps to resolve.
- ☐ Critique work quality, rather than the person.

Engagement

- ☐ Be punctual: arrive on time.
- ☐ Be attentive and contribute to team discussions.
- ☐ Dress and act in a professional manner.
- ☐ Team members will rotate duties every two weeks throughout the course (presenter, writer, note taker, organizer, etc.). List roles:

Additional Rules Developed by Team

- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Attach additional team rules if more space is needed

"The main ingredient of stardom is the rest of the team" –John Wooden

Step 3: Resolution Strategies

In the event of team conflict, have a plan in place for resolving.

- If there is disagreement, discuss and then vote. A vote of most members (at least two-thirds) is needed to enact a resolution strategy.

☐ **Team Meeting**: Any member can call a team meeting. The meeting will be held within one week. These meetings will generally be held on: *(circle one)* M T W Th F Sa Su at _____ *(time)*.

☐ **Vote**: Hear from all sides, then a team vote will resolve. Majority rules. Move on.

☐ **Arbitrator**: For unresolvable conflicts, _____ *(name)* will resolve. Decision is final.

Arbitrator can be anyone but must agree to this role by signing here: _____

☐ **Points**: The team may vote to exclude a member from receiving team project or team assignment credit. A two-thirds majority vote is required for each assignment. Course instructor should be notified within one week of each decision, preferable before the assignment is submitted.

☐ Other: _____

☐ Other: _____

Step 4: Agreement

By signing below, each team member agrees to the team rules and resolution strategies listed above.

- Submit the original copy to the course instructor by the announced due date, usually end of week.
- Scan, copy, or take a photo and distribute to all team members.

Print Name	Signature	Date

Team name (optional) Team motto (optional)

Symposium 1: Classroom Practices for Engaging i-Generation Students

CBI Lobby
8:45am

Facilitator: Audrey Murray, Hinds Community College

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=108

ABSTRACT

Universities and Colleges have put in place systems, processes, programs, structures, and strategic initiatives to increase equity on their campus. As diversity of campus populations increases, each campus must make sure that every student, staff member, faculty, and stakeholder has equal opportunity for access and success within the organization. This symposium will include panelists who bring years of experience, with program outcomes that illustrate some of the best institutional-level practices around empowerment and equity. Panelists will also be encouraged to share their scholarship around their practices. Panelists have been selected by the uniqueness of their campus program, the transferability of their practices, and the impact on equity through assessment as well as research.

PANELISTS

Notes

Effective Classroom Strategies for iGen

LaShunda Calvert, Hinds Community College

Recent research and college/university student surveys illustrate that Generation Z Students/ Learners do not feel engaged by passive learning anymore. In a society where most Generation Z Students/Leaners rely on technology for mostly everything, it is imperative that institutions of higher learning examine effective methods for keeping them engaged. Failing to recognize the necessity for accommodating Generation Z Students/Learners will result in college and universities experiencing a substantial trend of low attendance, low academic achievement, increased withdrawals, and declining graduation rates. Based on research, data findings, and the writer's college classroom experiences, Generation Z Students/Learners aspire to learn where they can be hands-on and directly involved in the learning process. After having taught students from the elementary level all the way to the university level, this panelist focuses on facilitating rather than lecturing, incorporating technology usage of Smart Phones, IPods, IPads, YouTube, Facebook, Instagram, Educational Apps, and developing social media inspired assignments. These have proven effective in increasing student zeal, excitement, and engagement. A favorite activity of mine required students to utilize an audio device to access music with an American theme pertaining to the American Revolution. Students explained the significance of the composer writing it and other components of the meaning to best describe the patriotism and happiness that Americans possibly felt after gaining their independence from England in 1776.

My Innovation

"Tell me and I forget. Teach me and I remember. Involve me and I learn." - Benjamin Franklin.

Although, this quote was made by one of the greatest Enlightenment thinker's centuries ago, it is still relevant today in the 21st century especially as it relates to young college students. Colleges and universities are vastly filled with millennials, better known as, "Generation Z," who are gamers, bloggers, tech savvy, social media addicts, and skilled electronic gadget users. They are accustomed to accessing information in a matter of seconds without much effort. Further, Generation Z learners are motivated by convenience, self-pacing, self-guidance, and ultimately being in control. Moreover, Institutions of Higher Learning have recently discovered through research and student surveys that Generation Z learners are no longer passive learners. Generation Z learners desire to be engaged and hands on.

Colleges and universities enrollment consist mainly of a generation of college students who rely mostly on technology for everything. Seemiller and Grace (2016) report that these Digital Natives (18 – 20) comprise the dominant generation of student's currently entering college. Further, Generation Z learners and Digital Natives find it extremely difficult to complete traditional assignments such as listening to a lecture and taking notes, reading a textbook or writing a research paper. It may be worthwhile to rethink standard or major assignments as a way to appeal and support modern students (Mohr, Mohr 2017). College and University Professors must acknowledge that Generation Z learners, network, socialize, communicate, and learn differently than Generation X and Baby Boomers do, and they must be willing to develop college course assignments that are conducive and relevant to Generation Z learners.

College professors should be willing to develop course activities that embed technology, real world connections, and prepare them for their careers. According to Kathleen Mohr and Eric Mohr (2017) instructors should carefully explain the rationale and value of assignments, highlighting how a task or project helps students learn what will be necessary in the workplace or life beyond college. There are several innovative assignments that college and university professors can employ in their courses for Generation Z learners that require facilitation rather than lecturing. Technology usage promotes motivation and excitement, student engagement, and academic success. These assignments include the following: Open Class Discussions, Current Events, and Group Projects. These innovative activities keep

students engaged, motivated, make learning easier and fun, and promote academic success!

Open Class Discussions is one of the most effective methods for keeping Generation Z learners engaged. Open Class Discussions gives them the perception that they are in control and free from traditional college courses bombarded with lecturing and note taking. Current Events provides students with the opportunity to make real world connections with the past and the present. Moreover, Current Events allow students to utilize social media, You Tube videos, online articles and the internet to compare what happened in the past to the present. Lastly, Group Projects give students the opportunity to engage with one another, collaborate, feel a sense of control, freedom to be creative, hands on, and it teaches them teamwork and goal setting. These innovative assignments permit Generation Z learners to utilize their IPad, IPod, laptops, Smart phones, and even their Smart Watches to complete assignments in my class.

In conclusion, Generation Z learners want to feel involved in the learning process. They aspire to enroll in college courses with educators who understand their passion for technology, need for convenience, engagement, self-guidance, and self-reliance. Institutions of Higher Learning must be willing to adapt, modify, and improvise for students who are our future leaders.

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Hashtags, Pinterest, and YouTube: Speaking the Language of Students from the Social Media Generation

Kristina Miller, University of South Alabama

Educators are constantly challenged with engaging technologically savvy Millennial and Generation Z students and must develop creative ways to "speak" the millennial student's language. Additionally, students from these generations are digital natives as they have grown up with technology at their fingertips, and they are exceedingly embedded in social media. As educators, we must utilize the characteristics of these students to enhance teaching and develop creative ways to start "speaking their language." Many educators employ the use of Facebook within courses as a way to connect to students. However, the social media generation student is also very familiar with the platforms of Pinterest and YouTube and is adept in creating and using hashtags for use within Twitter. Now it is up to faculty to put these online tools that our students are familiar with to good use!

Twitter utilizes short, 140 character messages that are often followed with a label, called a hashtag. Nursing faculty within an undergraduate pediatric nursing course have incorporated hashtags onto PowerPoint slides to help students remember important concepts and also to provide some comic relief during lectures. Students are also tasked with developing their own hashtags and turn in them in order to win contests. Faculty then use the student developed hashtags within future lectures. Anecdotal feedback from students is overwhelmingly positive and students take this study tip forward for use in future courses. Future ideas include embedding these hashtags within a course Twitter account that students follow in order to help send out study reminders and tips, again harnessing a technology they are accustomed to using.

Pinterest is a visual discovery tool where one can "pin" items to a virtual bulletin board and when a user clicks on one of the pins it will take them to a website that contains the content of the pin. Faculty in the same undergraduate pediatric nursing course have created Pinterest Boards for each content area. These boards contain study tips, videos, engaging illustrations of disease processes, and other helpful websites. By offering so many different avenues for learning content, the Pinterest Board can help students with various learning styles. Faculty have also created assignments for students where they must create their own Pinterest Board on a particular topic. As students are searching Pinterest for items to "pin" to their boards, they are reading and watching videos, which results in learning while using their native technology.

Finally, faculty have also utilized YouTube videos within the undergraduate pediatric course. YouTube is a video-sharing website where people can view or subscribe to video channels and Social Media Generation students are also well accustomed to using this platform on a daily basis. Videos are often included within the classroom in order to help better explain difficult concepts, show an actual procedure or example case when visual demonstration is more beneficial than lecture only, and again will help meet the needs of a variety of learners. Within the Learning Management System for the course, several YouTube channels, produced by a diverse body of registered nurses, are recommended for students. These channels include videos on study tips, practice NCLEX questions, disease processes, and provide positive and encouraging words to students.

The process of connecting with Millennial and Generation Z students and keeping them engaged within the classroom is often difficult for educators. However, by utilizing technology with which students are familiar, faculty can create a learning environment that is attractive to the student and help to address the needs of diverse learners. Harnessing the social media platforms used by this new generation of students can help faculty support the learning practices of students by "speaking" their language.

Notes

Social media and professionalism: Setting the boundaries, leveraging the sharing economy

Henry Rubin, Quincy College

This presentation will share a set of inter-related classroom practices that effectively leverage the sharing economy, which is native to the i-Gen students, to set boundaries around the use of technology and to teach professional norms and behaviors to them in the context of a course on Interpersonal Communications. Practices will include: effective cell-phone regulation, integration of "on the spot" searches, social media self-presentation, and age-culture norms for technology in school and work.

Introduction

Almost without exception, people have trouble regulating phone usage. We are all facing new challenges in the classroom and beyond with the availability of social media, digital stimulation, and constant access/availability to friends, family, workplace. I struggle to limit my usage, my students clearly struggle to moderate, and I have even observed phone alerts going off while college leadership address faculty and staff. Our attention spans are shortening while demands on our attention are increasing. Multi-tasking is not effective (Szumowska, 2018; Kononova & Yuan, 2016; Wood et al., 2012). Yet, there is a fundamental opportunity to use smart phones in the classroom to increase engagement, interactivity, and address current events and specific interests of students (mass customization/personalized lesson development).

Aside from their native comfort with smart phones, there is wide-spread cultural comfort with the **sharing economy** (Cheng, 2016; Seemiller & Grace, 2016) among current students. This comfort is most obvious in their quick adoption of Uber and other ride-sharing apps whereby they forego the hassles and expense of car ownership in favor of sharing cost of vehicles as needed. They intuitively understand the benefits of sharing over owning: lower costs, no parking or maintenance, no insurance, no gas, environmentally friendlier, less traffic congestion, on-demand access, spreading costs over time and across groups of people. In addition, reputation-based ratings systems encourage drivers to provide excellent service and riders to respect the property of others. This "sharing economy" can be the foundation beneath a rekindled "common good" that balances the extreme individualism that has dominated American society for the last 40 years.

My pedagogical goals are to create an engaging, participatory classroom where students self-regulate and moderate their smart phone usage, becoming aware of the distractions and opportunities presented by the new technology, and to reinforce norms around interpersonal communication. The context of these particular strategies is a required course on Interpersonal Communications offered by the Sociology department at a two-year college. Students in the division of Professional Programs (computer science, criminal justice, exercise science, engineering, medical billing and coding, accounting, marketing, business administration) are required to take this course in preparation for entering the workforce after graduation. Our emphasis is on professionalism. We practice essential skills such as active listening, self-presentation, language usage, conflict mediation, cultural differences, and accountability.

I have integrated four smart phones techniques into my pedagogy:

1. On the spot lessons, "look it up". Team-oriented investigations using phones.
2. Extra credit cellphone etiquette points.
3. Listening exercises in Interpersonal Communication class
4. Social media self-presentation.

Classroom Techniques

Like most professors, I struggle with engaging students who are more and more distracted by the technology they have in their pockets in the form of mobile smart phones. Over the years I have

tried various strategies to constrain and prevent students from using their devices in class, some more successful than others. Yet, I also recognize the incredible power and value of the smart phone. Like most people who are digital natives, our current students use their devices constantly to obtain facts, to do non-academic research into topics that are of interest to them. They are more able to search for and find relevant data for their everyday lives (what time does the movie start, what is the weather, where are my friends, who starred in the movie etc.) However, they are less adept at vetting the data that they need for scholarship or for work. Beyond a straightforward Google search, their search skills are often inadequate. Blocking usage of smart phones in the classroom is a futile exercise and ignores the pedagogical power and learning opportunities offered by these devices. As usual, we would do well to remember the fundamental sociological tenant that technology does not determine usage; usage of technology is determinate of its nature (Starr, 2004).

Pedagogical strategy must integrate technologies into the classroom experience. Certainly, the use of LMS, email, chat, and shared documents have been an entry point for even the most reluctant faculty. As we move to teaching the i-Gen, or digital natives, we must ourselves become comfortable with the tools and, in some cases, learning from our students is an excellent strategy. As faculty, we have probably all faced a student whose question goes beyond our knowledge or a student who questions the veracity of the facts we present or the argument we make. The good news for faculty is that we no longer have to fear that moment or respond defensively. Instead, that becomes a learning opportunity where we look it up **"on the spot"**. This strategy began organically when I faced a question I could not answer. A student with a laptop asked if it would be okay for them to look up the information. I agreed and continued with the lesson while the student did a search. Once the student found a source, she beamed it to me and I pulled up the web site on the classroom desktop and projector. Soon enough we had an answer to the question and we had the opportunity to vet the source for legitimacy, reliability, currency, accuracy etc. Other students chimed in, pulling up other web sites and comparing them to the first. Teaching the students the differences between sources, seeing how the authors used the different evidence to build an argument was more instructive than the canned class lesson I had planned. Now, I encourage students to "look it up" on the spot whenever relevant. Sometimes I offer extra credit to students who look it up and write up a short response after class. We post high quality responses on our LMS site and students add discussion threads with their own sources stimulating debate and discussion. I always tell the students that they must put their phones away once we finish with the "look it up."

In order to ensure that students use their devices when I deem it appropriate, I have instituted a policy designed to regulate digital etiquette. The policy is written as follows in the syllabus.

> *In order to create a respectful and effective learning environment, I believe we should try to keep all other distractions to a minimum. This is especially true when it comes to cellular phones and texting. Therefore, I require that you turn off your cell phones and refrain from texting during class. To encourage you to respect this policy, I award all of you 10 extra credit points toward your lowest score on an exam. These points are yours to lose. Every time your cell phone rings or I catch you texting you will lose 2 points for yourself and for every person in the class.*

I make a point of going over this policy explicitly during the initial presentation on the syllabus. Students express surprise and launch us into a discussion about distractions, multi-tasking, and attention span. Inevitably the discussion leads one student to ask why he should be punished for the actions of the others. Here, I take the opportunity to talk about the common good and the need to be accountable to others. This fits in nicely with my course on Interpersonal Communications where we emphasize professionalism. More than any other single strategy, this has radically cut down on device usage unrelated to the course.

Students in this cohort are more likely to understand the notion of the common good because of their participation in the sharing economy. The development and adoption of the sharing economy makes it possible to get buy-in from students through class discussion of attention deficits, professionalism, lis-

tening, and respect. What affects one person, affects us all. Some students remind one another at beginning of class, gently asking the others to put away their devices. All of this helps to foster the common good in the classroom. Students and instructors embrace notions of accountability to one another.

Employers are looking for "team players" who work well with others and cooperate rather than compete to achieve desired ends. The phone etiquette points thus reinforce the mindset that employers are seeking while simultaneously teaching students to self-regulate. The shift from externalized fear of punishment to internalized acceptance of the norms of the classroom is due to the policy that encourages communal policing of norms. This policy and the discussions that follow are an excellent segue to a consideration of how norms vary according to generations and the expectations of their future employers and supervisors. Students who have grown up as digital natives rarely consider how their own usage is perceived by their bosses. Rather than a straightforward prohibition of the use of smart devices in class, I find that a much more effective strategy is to bring this into our conversation about professional expectations, allowing students to understand the perspective of their employers, and become self-regulators.

Another means of creating a deeper understanding about such matters is a **listening exercise** we practice. Students are paired off in twos and instructed to tell a story about a simple mishap from the week, something from their own lives where a small matter, like missing a bus, contributed to further difficulties during the day. The students are instructed to take turns listening to and telling their story to the other. The choice of story is irrelevant. In the first round, each student tells his or her tale of woe and her partner is instructed to "purposefully fail to listen" while their partner tells their story. They interpret this instruction in a variety of ways, but many times they take out their device and pretend to check it, fiddle with it, text, or tweet.

In the second round, students are instructed to listen carefully and demonstrate active listening skills (eye contact, body posture, putting down or away all distractions, paraphrasing, questioning etc.). Students are then asked to reflect how round 1 contrasted with round 2, from both positions of listeners and speakers. They report that as storytellers, they shortened their stories, skipped important details, felt ridiculous, trailed off, and generally felt disrespected as speakers. Listeners reported that they felt awkward, weird, bad, and disrespectful. They said that they could not faithfully reproduce the story of their partners and missed important elements of the story. They lacked empathy for the plight of the storyteller and were less able to engage in meaningful commentary. The exercise concludes with discussion of real life examples when failure, often due to digital device distractions to listen had a negative impact on a relationship or event.

The last strategy I will share involves **social media**. For this lesson, students first are introduced to the concepts of self-presentation and identity management in real life. Then, we consider how self-presentation and identity management operate in the digital realm of social media. In particular, we discuss the limits of privacy on Facebook, Instagram, Linked In and other platforms. The students seem to grasp this intellectually, but a recent innovation occurred took this technique to the next level: I asked students to pull out their smart phones and to open to their most used social media app. Students were then instructed to pass their phone to the person to their right so that their classmates could examine their social media self-presentation and critique it from the point of view of an employer. I asked students to describe the person based on their media representation. Students were reluctant to pass their phones to their classmates and expressed dismay at what might be found. When they assumed that their media representations were for a general audience, it seemed that students were much less distressed whereas when faced with a single person auditing their social media, the students found it practically intolerable. After the exercise, we debriefed in a discussion about online identity management and considered why they felt more distressed to share with a single co-present person. The implications were clear; students were more likely to shape their identities in a professional manner when they understood that a general audience of many people was, in fact, a group of concrete others whose perceptions would be influenced by the students' mediated representations of themselves.

In answer to Audrey Murray's questions for this presentation, I will conclude by saying that faculty must be comfortable with spontaneity and interruptions in the classroom. They should be comfortable with smart phone apps of various kinds and familiar with social media sites (FB, Instagram etc.). They must give a measure of control to students while simultaneously set clear boundaries of when and what kind of phone use will be accepted and what will not be tolerated. Technological expertise is helpful, but more important is setting boundaries and a willingness to share control of the classroom to build the common good.

Currently, the evidence of the success or failure of these techniques is strictly anecdotal. My next steps are to implement quantitative assessment data of student outcomes. I would estimate that most classes lose no more than four of their 10 points over the course of the semester. I have had the cellphone etiquette policy for five years, 12 classes per year. Over time, I have observed that students are better able to self-police their own use of phones. They appreciate the lack of distractions, the rewards that come from deep classroom engagement. They notice how their listening skills have improved. Like most students motivated by extra credit, they report that they get a lot out working in teams for "on the spot" searches. These flipped classroom activities build greater ownership than a traditional lecture format and allows for the mass customization of education.

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Teaching statistics to ambitious digital natives: Emphasizing job skills, data ubiquity, and making it free

Jessica Hartnett, Gannon University

When college faculty puzzle over how to reach their 20 year old students, they typically think in terms of harnessing technology to reach digital natives. Innovative use of technology certainly aids teaching and learning, but faculty should consider another important demographic features of their audience. These students are taking on considerable debt to pursue their education ("Student Loan Debt In 2017: A $1.3 Trillion Crisis," n.d.), and their main reason for doing so is to ensure better careers (Mulhere, n.d.). This presentation will demonstrate ways to connect with modern students, using technology to address their larger career and life goals.

Cost-conscious digital natives

Traditionally aged college students are often pigeonholed as being obsessed with social media and smartphones, but their technological fluency is hardly the only quality that defines these students. They are coming of age during a time when achieving the American Dream seems less likely (Leonhardt, 2018) and they are acutely aware of their college loan debt. These worries have created students who are concerned with their education's return on investment and employability following college.

Instructors can address and allay their students' concerns about the future by harnessing their students' technology strengths, by using free, online, contemporary teaching materials to strengthen resumes, convince their students of the ubiquity of data in modern life, and help students avoid (more) debt.

Resume building: Data analysis skills

Many statistics courses are required classes for serving a wide variety of majors. As such, students are prone to treating it like a necessary evil on the way to their degree. This can be countered by explicitly teaching students that a) statistics are a desired job skill because b) data is everywhere.

To encourage this, it is useful to share data from hiring firms about employer desire to hire individuals with data analytic skills (Bortz, n.d.). Once you have established the desirability of statistical skills, instructors must teach students to be statisticians, and statisticians use software and proper statistical thinking to solve problems. As such, instructors should minimize by-hand calculation and maximize analytic skill development via technology. There are many statistical software tools, free and not free, that allow you to do so, including JASP, PSPP, and R.

Teaching statistics via Facebook and Instagram: Engaging, contemporary examples you can't find in textbooks

In addition to doing the statistics hard sell via software skills, contemporary class examples soft sell the ubiquity of statistics and statistical thinking in everyday life. Why use standard examples of central tendency when you can use an Instagram post to emphasize the shortcomings of mean (Chalabi, 2016)? A story about infants born addicted to opioids teaches research methodology(Gourlay, 2016) and shows how research and data analysis are used in medicine. The Kelly Twins, who are both brothers and astronauts, provide a medical, aeronautic example to conceptually explain statistics t-tests that are integral to NASA's preparation to travel to Mars (Kennedy, 2016).

Modern examples can also be used for larger in class projects, like teaching students Google Forms in order to gather data from Facebook (Hartnett, 2013) or using simple correlation as a way to teach data mining (Hartnett, 2016).

Use as many free, online resources as possible

Another source of anxiety for our students is money. Most college students are work part and full time jobs, are over scheduled, and pay an average of $1,200 every year for textbooks. The same students also favor completing assignments and readings via their smartphones and tablets. Instructors can easily replace their $200+ textbooks via open education

resources. Khan Academy, Annenberg Foundation, Open Education Resources Commons facilitate the transition to high quality, free resources. For statistics courses in particular, free data analyzing software, such as JASP, PSPP, and R are are readily available during the course and can also be accessed by student long after your course is over.

Closing Thoughts

While the topic of this presentation is a statistics course, the ideas presented apply more broadly across disciplines. Instructors shouldn't be affronted when student want to know how your class is going to make their futures brighter. Couch your lessons and examples in contemporary examples, build specific skills when possible, and seek out free materials.

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Enhancing the Theory of Performance to Support Universal Performance Potential

CBI 010
10:45am

Facilitator: David Leasure
Research Director, Academy for Process Educators

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=112

OVERVIEW

Process educators use assessment to improve a student's future performance by applying Elger's *Theory of Performance* (2007) during quality measurement to explain observed strengths, understand and recommend improvements to observed opportunity areas, and to gain insight into the challenges faced by performers and assessors in making sense of a performance, as described in Apple and Baehr (2007). The power of the technique comes from its extrapolation of the mechanism result in the performance over strictly assessing the performance outcomes.

The following statements capture opportunities for enhancement of the approach.

1. Define the components of Identity based on work by Moore (2017) and others
2. Expand the utility of learning skills to performance characteristics capturing mindset, dispositions, and skills of performance and learning, from the work on professional characteristics by Apple, Ellis, & Leasure (2018)
3. Criticize a proposed model of Self-Regulated Performance adapted by Leasure from Self-Regulated Learning (Winne & Hadwin, 1998) and informed by Popper (1978) and Beaudoin (2014)
4. Update the use of competencies as performance standards and the evaluation method needed to predict future performance quality vs simply yielding a measure of the observed quality based on Leasure et. al (2018) and *Measuring Mastery* (McClarty & Gaertner, 2015)
5. Measure performance characteristics and determine the relationship of the measure to quality of performance, and thereby develop a theory of universal performance potential
6. Criticize a set of proposed principles that support universal performance potential based on the PE Principles as presented by Beyerlein et al. (2007)
7. Discuss challenges with the theory of Universal Performance Potential caused by enhancements to our understanding of knowledge as a work in progress

LEARNING OUTCOMES

1. Collaboratively create a framework for Identity that can be applied to guide identity development
2. Define the role of characteristics that join together mindset and learning skills
3. Co-develop iteration 2 of the self-regulated performance model and apply this model to improve the quality of performance assessment
4. Brainstorm improvements to the Theory of Performance, including characteristics and identity
5. Identify and resolve issues with the concept of Universal Performance Potential (UPP) around the hypothesis, using the measures, implications for instructional design
6. Review and refine the Universal Performance Potential Principles

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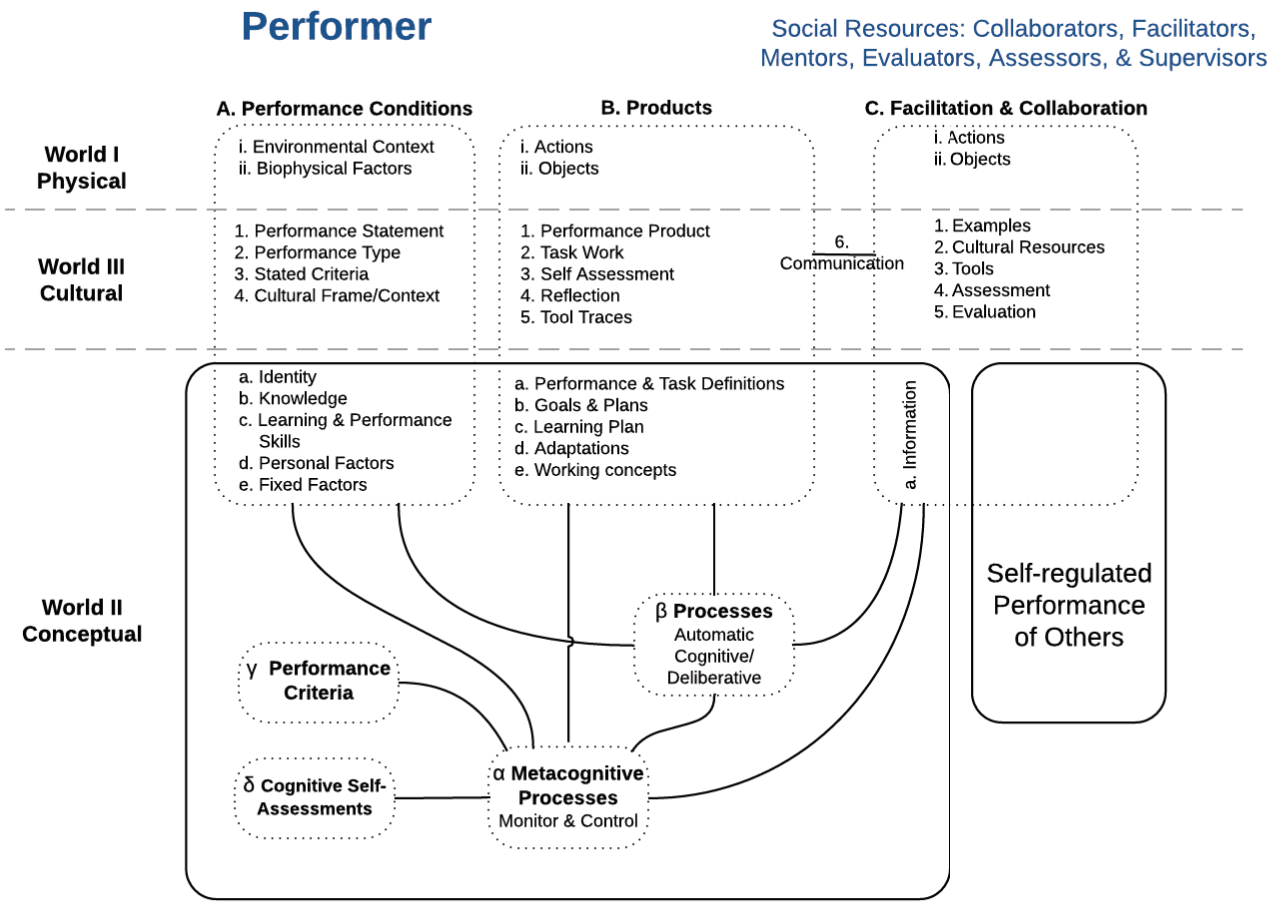
PLAN

1. Apply 6 component model of identity to model performers and record findings (15 minutes)
2. Measure the model performers with the professional characteristics assessment rubric and record insights (20 minutes)
3. Review the model of self-regulated performance and its application to assessment and record insights (20 minutes)
4. Develop (10 minutes) and apply (20 minutes) critical thinking questions about the Principles of Self-Growth recording questions and criticism (total 25 minutes)
5. Assess the Workshop (5 minutes)

Model of Self-Regulated Performance



Profile of a Star-performer

A professional self-grower at the star-performer level displays the qualities described in the following table. Through disciplined self-growth and thoughtful self-assessment, you can attain these qualities.

#	**Professional Characteristics**	***Expectations of a Professional Self-Grower at the Star Performer Level***
1	Learner Ownership	*Learn for themselves by setting own learning goals and learning expectations*
2	Thinks Critically	*Ask essential questions to make sense of what is going*
3	Contextualizes	*Help others to contextualize by consulting its use for their situations*
4	Generalizes	*Can adapt and apply knowledge in different disciplinary contexts*
5	Meta-Cognitive	*Self-mentor by using their own self-awareness of how and why they do things*
6	Information Processor	*Want to review all sources that have been deemed valuable*
7	Reader	*Use the new knowledge to create new questions and new ideas to pursue*
8	Writer	*Uses writing to ask questions, identify new connections, make new discoveries within oneself, and explore metaphors and fresh purposes of ideas*
9	Problem Solver	*Are nearly always disciplined in using steps to find a solution that is usually effective*
10	Reflects	*Use reflection productively to be on top of situations, gain personal understanding and maximize learning*
11	Open-Minded	*Use minimal filters and will consider any source and incorporate every valuable contribution*
12	Open to Feedback	*Will go out of their way to seek out strong feedback from people they value*
13	Self-Assesses	*Consistently and effectively self-assesses performance without judgment, thus self- affirming in the process*
14	Positive	*Energize everyone in the team and community*
15	Self-Efficacious	*Believe they will be successful in everything they try*
16	Inquisitive	*Want to be on top of every situation, new environment, research activity or conversation*
17	Clarifies Expectations	*Align personal standards to those of the manager or instructor to exceed expectations prior to deadlines*
18	Life Vision	*Have a well thought-out life plan that is annually adapted to integrate new opportunities*
19	Sets Goals	*Goals constantly evolve with each day's objectives supporting both updated annual and life goals*
20	Uses Resources	*Maximize the use of every resource to increase performance and success*
21	Plans	*Plans what should be done, by when, at what quality, and with a prioritized sequencing of activities*
22	Collaborates	*Consistently make valuable contributions for the benefit of everyone*

#	Professional Characteristics	*Expectations of a Professional Self-Grower at the Star Performer Level*
23	Validates	*Know that they know and when they don't know, learn what they don't know*
24	Assertive	*Step up when needed without pushing others aside to keep productivity high*
25	Works Hard	*Challenge themselves to work harder than the day before by finding ways to produce more value and eliminate wasted time.*
26	Engaged	*Fully alert and engaged 80 to 100% of the time*
27	Focused	*Almost never distracted and returns to focus easily – more than 80% of time*
28	Prepared	*Anticipate issues and rehearse strategies for resolving them. Ensure adequate resources and in-process checks*
29	Organized	*On top of it with a well- functioning system*
30	Manages Time	*Meet deadlines with sufficient time for feedback*
31	Self-Challenges	*Systematically stretch the level of challenge*
32	Takes Risks	*Seek opportunities to do so*
33	Persists	*Pull out all the stops to meet obligations*
34	Leverages Failures	*Produce measurable growth from each failure*
35	Maintains Balance	*Use exercise & diet to optimize fitness, renewing daily with plenty of sleep*
36	Committed to Success	*Won't disappoint self and others*
37	Manages Frustration	*Are calm and cool under pressure (James Bond)*
38	Adapts	*Size up the situation and will do what the situation requires*
39	Self-Motivates	*Are intrinsically motivated by what they want to learn and from their own growth goals*
40	Asks for Help	*Strong background preparation allows a mentor to perform transformational interventions*
41	Networks	*Networks with leaders*
42	Seeks Diversity	*Consistently seek new perspectives different from their own*
43	Communicates	*Understand what is being said by all team members & produces synergy*
44	Team Player	*Consistently energize and challenge the entire team to higher performance*
45	Speaks Publicly	*Speak in prepared and impromptu situations to friendly & hostile audiences*
46	Self-Starter	*Want to get going quickly and will use new strategies in new situations to learn and figure out what to do*
47	Prioritizes	*Tackle the important / difficult task now*
48	Disciplined	*Motivate others to desire to complete work before play*
49	Self-Confident	*Willing to "fake it till they make it" and learn as they go*
50	Responsible	*Assume responsibility for achieving success and does the work to succeed*

Professional Characteristics Assessment Tool

PGSG Characteristics	*Star Performer*	*Self-Starter*	*Responsive Individual*	*Content Individual*	*Static Individual*
1. Learner Ownership	For Learning's Sake ☐	Improve & Refine ☐	Focus on Understanding ☐	Focus on Knowledge ☐	Supervisor / Teacher-centered ☐
2. Thinks Critically	Challenges thinking ☐	Tests boundaries ☐	Constructs Knowledge ☐	Sees connections ☐	Memorizes ☐
3. Contextualizes	In all possible areas ☐	Across broad areas ☐	Multiple areas ☐	In areas of interest ☐	Familiar Situations ☐
4. Generalizes	Inter-disciplinary ☐	Within discipline ☐	Move to Similar ☐	Move to familiar ☐	Repeat ☐
5. Meta-Cognitive	Self-actualizer ☐	Self-monitors ☐	Reflects with purpose ☐	Reflect when Confounded ☐	Instinctive ☐
6. Information Processor	Novel resources ☐	Full resource array ☐	Necessary resources ☐	Standard resources ☐	What is given ☐
7. Reader	Generates ideas ☐	Integrates knowledge ☐	Produces meaning ☐	Follows author intent ☐	Memorizes facts ☐
8. Writer	Clarifies new ideas ☐	Extends meaning ☐	Elucidates meaning ☐	Restates ideas ☐	Presents Information ☐
9. Problem Solver	Solving consultant ☐	Optimize/ generalize ☐	Solves w originality ☐	Uses routine approach ☐	Lets others solve it ☐
10. Reflects	Reinvent Self ☐	New direction ☐	Produce Some Clarity ☐	As problems arise ☐	In moment only ☐
11. Open-Minded	Door never closed ☐	Seeks diversity ☐	Open to new ideas ☐	Group mind ☐	Self-limiting ☐
12. Open to Feedback	Continuous ☐	After each performance ☐	If helpful ☐	When necessary ☐	If affirming ☐
13. Self-Assesses	Continuous ☐	Regular & structured ☐	If really important ☐	If required ☐	Limited effectiveness ☐
14. Positive	In all pursuit areas ☐	When Improving ☐	In expertise area ☐	In interest area ☐	Occasionally ☐

PGSG Characteristics	*Star Performer*	*Self-Starter*	*Responsive Individual*	*Content Individual*	*Static Individual*
15. Self-Efficacious	Even in brand new contexts ☐	In most contexts ☐	In some contexts ☐	Insecure ☐	Defeatist ☐
16. Inquisitive	Explores new areas ☐	Extends boundaries ☐	Timely questions ☐	In areas of interest ☐	Immediate need ☐
17. Clarifies Expectations	Raises for stakeholders ☐	To perform soundly ☐	When important ☐	When rewarded ☐	When failing ☐
18. Life Vision	Transforms others ☐	Develops work & team ☐	Manage job & family ☐	Extends as needed ☐	Day to Day ☐
19. Sets Goals	Aspirational goals ☐	Evolving goals ☐	Life goals ☐	Annually ☐	For today ☐
20. Uses Resources	Finds new resources ☐	Full resource array ☐	Standard resources ☐	Uses given resources ☐	Sporadic ☐
21. Plans	Masterly plan & envision ☐	Revise plan/ vision ☐	Basic plans ☐	Rough plan ☐	Takes direction ☐
22. Collaborates	Helps others produce ☐	To produce more ☐	Works for team ☐	As directed ☐	Self-interest ☐
23. Validates	Continually checks ☐	Regularly ☐	Before submitting ☐	When essential ☐	Lets others do it ☐
24. Assertive	Where most effective ☐	To keep on track ☐	When skilled & confident ☐	When asked ☐	Learned not to ☐
25. Works Hard	New pursuit energy ☐	Gets projects done ☐	Within set hours ☐	To get by ☐	When supervised ☐
26. Engaged	80% - 100% ☐	60% - 80% ☐	40% - 60% ☐	20% - 40% ☐	10% - 20% ☐
27. Focused	All of the time ☐	Always job ready ☐	Often ☐	Sometimes ☐	Occasionally ☐
28. Prepared	Top of their game ☐	Performs ably ☐	Adequate ☐	The basics ☐	Wings it ☐
29. Organized	Systemized structure ☐	Fully sound structure ☐	Adequate structure ☐	Minimal structure ☐	Disorganized ☐

PGSG Characteristics	*Star Performer*	*Self-Starter*	*Responsive Individual*	*Content Individual*	*Static Individual*
30. Manages Time	Optimal productivity ☐	Detailed plans ☐	Basic plans ☐	For essentials ☐	Overwhelmed ☐
31. Self-Challenges	To continually grow ☐	Expands avenues ☐	Within expertise area ☐	When supported ☐	Avoids challenges ☐
32. Takes Risks	Advance self & others ☐	To stay in front ☐	Key accom-plishments ☐	If sure success ☐	When threatened ☐
33. Persists	If paradigm falters ☐	Always ☐	To avoid big failure ☐	If encouraged ☐	Infrequently ☐
34. Leverages Failures	New growth plan ☐	New action plan ☐	Identifies failure causes ☐	Accepts results ☐	Blames others ☐
35. Maintains Balance	Builds endurance ☐	Optimizes ☐	Fulfills basic needs ☐	Self-indulgent ☐	Self-destructive ☐
36. Committed to Success	Throughout processes ☐	Responsible always ☐	In selected areas ☐	If directed ☐	Not committed ☐
37. Manages Frustration	Guides understanding ☐	Analyzes & improves ☐	Changes something ☐	Takes a time out ☐	Withdraws ☐
38. Adapts	Continually ☐	To improve ☐	When it makes sense ☐	If it will work ☐	If no other option ☐
39. Self-Motivates	Marshalls engagement ☐	Energized & ready ☐	Has areas of passion ☐	In interest area ☐	Needs motivation ☐
40. Asks for Help	Widen understanding ☐	Maintain work flow ☐	Only when positive ☐	When prompted ☐	Rarely ☐
41. Networks	Networks with leaders ☐	Involves others ☐	Networks ☐	Several contexts ☐	A few close friends ☐
42. Seeks Diversity	Cross-cultural ☐	Engages cultures ☐	Seeks new perspectives ☐	Tolerates cultures ☐	Only similar culture ☐
43. Communicates	Sends & receives ideas ☐	Listens & speaks ☐	To learn & inform ☐	Basic ☐	Selective ☐
44. Team Player	Any role effectively ☐	Synergistic in roles ☐	Adapts to new roles ☐	Plays a few roles ☐	Reluctant to join ☐

PGSG Characteristics	*Star Performer*	*Self-Starter*	*Responsive Individual*	*Content Individual*	*Static Individual*
45. Speaks Publicly	To propagate ideas ☐	To manage team ☐	Part of normal roles ☐	Rarely ☐	Under duress ☐
46. Self-Starter	Always seeks results ☐	Starts when needed ☐	Starts on permission ☐	Starts when directed ☐	Not self-starting ☐
47. Prioritizes	Continually adjusts ☐	To meet outcomes ☐	Current stated goals ☐	Focused on easy ☐	Does what asked ☐
48. Disciplined	Whatever is necessary ☐	To add productivity ☐	To meet deadlines ☐	When being paid ☐	When observed ☐
49. Self-Confident	Creates challenges ☐	In new challenges ☐	Within profession ☐	Builds on success ☐	When practiced ☐
50. Responsible	Even when constrained ☐	Generates success ☐	Meets basic outcomes ☐	For small tasks ☐	If things go well ☐

Principles for UPP, Version 1.0

1. *Know yourself*: awareness of thoughts, feelings, spirituality, narratives, values within and about yourself as distinct from others and your context (identity, fixed & personal factors, affective domain)
2. *Perform*: observe and direct thoughts, manage emotions, choose and control actions in real time to achieve criteria, in accordance with identity and accounting for personal and fixed factors (performance, problem solving, self-regulation, task management, affective domain, cognitive domain, and psychomotor domain)
3. *Learn*: ability to acquire, maintain, elevate, and improve knowledge
4. *Lead*: know and appreciate others, rely on others, motivate and support others, interact, commune spiritually, and communicate; build community (social skills domain)
5. *Develop*: Assess your performances and improve your capacity to perform with higher quality and broader contexts by improving learning skills, knowledge, identity, and personal factors (Personal Development Methodology)
6. *Envision*: look forward individually and collectively, to create a future for self and others, and make plans to achieve (time management, goal management, problem solving, planning; affective, cognitive, social, and spiritual domains)

Notes

205 BISL
10:45am

The "Why" and "How" of Implementing Team-Based Homework

Facilitators:
Dan Cordon and Sean Quallen, University of Idaho

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=115

OVERVIEW

Team-Based Learning (TBL) has been around since the 1970s and is a teaching strategy that aligns well with Process Education. In this workshop we are asking participants to reflect on their teaming experiences, and work through a series of questions that should help uncover their perceptions of how teaming can be used effectively in their classrooms. Personal discoveries will be shared in smaller workgroups, with the goal of helping each participant develop an informed teaming strategy that can be used in their own classes.

LEARNING OUTCOMES

- Identify benefits and challenges associated with homework assignments in team-based learning.
- Formulate strategies for unlocking the power of team-based homework assignments in one of your courses.

KEY CITATIONS

- Wang, C., and Mott, J, "Implementing Team Based Learning in a First Year Introduction to Engineering Course" ASEE Annual Conference (2015)
- Michaelsen, L. K. and Sweet, M. (2008), The essential elements of team-based learning. New Directions for Teaching and Learning, 2008: 7-27. doi:10.1002/tl.330
- Using a Developmental Model to Facilitate Team-Based Design Experiences in a Pre-College Engineering Science Camp (IJPE, Volume 1)
- Enhancing a First-Year Success Course through Process Education (IJPE, Volume 4)

PLAN

- Inventory team-based learning strategies used by participants. (10 minutes)
- Complete questionnaire getting at the positive aspects of teaming, and the predicted problems associated with implementing teaming for classroom assignments. (5 min)
- Within small groups, discuss the Top 5 roadblocks to team assignments. (15 minutes)
- Report out your Top 5 roadblocks to the large group. (5 minutes)
- In small groups, come up with two strategies to address each of the roadblocks identified by the large group. (15 minutes)
- Report out your strategies to the large group. (5 minutes)
- Individually, complete a planning worksheet for a team-based assignment in a setting under their supervision. (15 minutes)
- Within small groups, share team-based assignments and methods for establishing accountability partnerships. (15 minutes)
- Complete workshop assessment form. (5 minutes)

Notes

Risk/Success Factors for iGen Students

CBI 300
10:45am

Facilitator: Joann Horton

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=118

ABSTRACT

This session includes papers that enhance understanding of academic risk factors of incoming traditional age students on college readiness, programs that are targeted to provide for college readiness of these students, and approaches in first-year experiences that innovate to reach this new generation.

Note that papers for this session are exerpted if longer than 8 pages in length. Full papers may be found online in the resources available for this session.

PANELISTS

Notes

Academic, Professional, and Personal Impact of Skills Acquisition for Nursing Students Following a Structured Process Education Experience: Learning to Learn Camp

Audrey Murray, Hinds Community College

Abstract

High attrition rates in schools of nursing decrease nurses in the workforce. The purpose of this study was to determine the perceived effectiveness of skills obtained during the Learning to Learn Camp and the student's ability to achieve academic, professional, and personal goals and complete the nursing program of study. The investigator selected a diverse sample of participants who completed the Learning to Learn Camp and returned to the program of study. Data were collected from interviews until data saturation and analyzed via content analysis. Many themes emerged and overlapped with the major themes being time management, self-assessment, faculty and peer support, and organizational skills. Results of the study indicated that skills obtained are effective in empowering students to be independent, self-directed learners. Considering the perceptions of the participants, a contextualized Learning to Learn Camp designed to facilitate nursing student growth is an effective strategy for empowering students to become self-learners.

Background

Attrition rates are as high as 47% in associate degree nursing programs (Harris, Rosenberg, & O'Rourke, 2014). When schools of nurses are unable to produce graduates, who are eligible to take the licensure exam, the result is a decrease of nurses in the workforce. The decrease of nurses is likely to negatively affect the quality of nursing care. Therefore, schools of nursing are obligated to explore reasons for high attrition rates, alleviate barriers to program completion, and increase student success.

An essential approach to alleviating barriers to completion of nursing school begins with determining at-risk students. Nontraditional students, students with language barriers, ethnically diverse students, and students from various demographic areas are at-risk for attrition. Students who have lower grade point averages in prerequisite courses, lower American College Testing (ACT) scores, and poor grades in initial nursing courses are at high risk for failure (Harris et al., 2014). Other factors placing students at risk include student's feelings of isolation, cultural differences, precollege academic disadvantages, and lack of faculty support (McKendry, Wright, & Stevenson, 2014).

Schools of nursing have implemented many strategies to reduce and prevent attrition and increase student success. Some of those strategies include faculty and peer mentoring, financial support, and early recognition and intervention for those students who have been unsuccessful on an exam, however many programs continue to have high attrition (McKendry et al. 2014). The school of nursing in this study has instituted a Learning to Learn Recovery Camp (the Camp) to aid in the retention of nursing students. Although Learning to Learn Camps exist, there is no research regarding a contextualized Learning to Learn Recovery Camp for nursing students.

Meeting program completion rate requirements of the accreditation bodies increases the need for student retention and graduation rates, ultimately contributing to decreasing the nursing shortage. Strategies employed for student retention have been well documented in the literature. The success of the Learning to Learn Camp is that the Camp exercises multiple strategies for retention in a one-week conceptualized Camp. Therefore, employing the strategies of the Learning to Learn Camp in schools of nursing should increase student retention.

Learning to Learn Recovery Camp

The Learning to Learn Camp is an intense five-day experience that challenges students to grow and develop skills that are essential to college and life. The Learning to Learn Camp integrates learning how to

learn and mentoring (Beyerlein, Holmes, & Apple, 2007). Participants of the camp are nursing students who have been unsuccessful in their program of study in two semesters and are required to attend and graduate from the Camp as one last chance to return to and complete their program of study. Before the establishment of the Learning to Learn Camp, after two course failures in either of the nursing program options, students were not allowed to return to the program of study where the failure occurred. This Camp is the only Contextualized Learning to Learn Recovery Camp for nursing students in the world. Therefore, there was an interest in the students' perception of the effectiveness of the skills acquired in the camp. The purpose of this study was to explore the perceived effectiveness of skills obtained in a structured Process Education experience (Learning to Learn Camp) and the student's ability to achieve academic, professional, and personal goals and complete the nursing program of study.

As a facilitator in the Camp, the researcher was aware of the transformation and successes of the students who successfully completed the camp. The questions that remained unanswered were the students' perceptions of the effectiveness of implementing the skills acquired in the Camp and if the acquired skills were effective with achieving their academic, professional, and personal goals. Also, the researcher investigated the perception of participants regarding academic goal achievements, professional goal achievements, and personal goal achievements after completion of the Camp. Additionally, the researcher explored the perceptions of the participants of the Camp regarding the recognition of personal areas of needed improvement (weaknesses) and how they improved in those areas.

Literature Survey

The review of literature included the theoretical support of Process Education/process learning, models of student retention, at-risk students, and student retention strategies. Considering the students attending community colleges, understanding the learning needs of nontraditional students is imperative (Chen, 2014). Chen avers that adult learners are self-directed, and learning is enhanced when the learners' prior life experiences are recognized and utilized in the learning process. Incorporating the adult learning theories and strategies is essential for facilitating adult learners and retaining students (Jeffreys, 2015). Many of the participants of the Camp were non-traditional students who felt the need to work to help support themselves.

Tinto's (1977) model for retaining students includes ensuring student engagement and involvement in college activities (Tinto). Therefore, a strategy to retain students is ensuring peer and faculty support because the indication was that academics alone were not the cause of student attrition, but socioeconomic and psychosocial factors also impact student success (Harris et al., 2014). Participants' demographics were congruent with Tinto's reason for lack of student success. Very few nursing students participate in extracurricular college activities. Frequently, participants lacked family support and stated they did not feel they had faculty and peer support. A key strategy of the Recovery Camp is Coach and Facilitator (faculty and staff) support. Coaches and Facilitators are volunteers who participate for the support of the students.

Other strategies for student success in nursing school include early recognition of at-risk students, early intervention, mentoring, faculty involvement, and tutoring. Some barriers of disadvantaged or at-risk students are poor academic preparation, ineffective study skills, and poor mastery of the English language (Igbo et al., 2011). The literature supported early recognition and intervention of at-risk nursing students to increase student success. Students are required to have a "C" in their anatomy and physiology class and other prerequisites. Many of the students who have the grade of "C" are at a disadvantage when they start the nursing courses. Students meet admission requirements, but have not had to develop study skills when in secondary school or while taking prerequisites are ill prepared when taking nursing courses.

Another key component of the Camp is facilitating self-directed learning and students taking responsibility for their learning. Malcolm Knowles (1983) defined self-directed learning as learners taking the initiative in identifying their learning needs, formulating learning objectives, finding resources to meet objectives, carrying out the plan, and evaluat-

ing whether the objectives are met (Hatcher, 1997). Processes to becoming self-directed learners include motivation to learn something new and to acquire additional skills and knowledge (Hatcher, 1997). Camp participants are given a syllabus with assignments, requirements, and expectations prior to the beginning of the camp. Failure to meet the requirements results in dismissal from the camp and the opportunity to return to the course of study.

Conceptual Framework

Bandura's Theory of Self-Efficacy and Shelton's Model of Student Retention (2012) were used as frameworks for guiding this study (Bandura, Barbaranelli, Caprara, and Pastorelli, 1996; Shelton, 2012). Many participants of the Learning to Learn Camp have lost belief in the ability to be successful as a nursing student and ultimately as a nurse. Bandura's theory identifies perceived self-efficacy as the belief in what a person is capable of doing and organizing and executing the courses of action needed to produce given attainments (Dapremont, 2013).

Shelton's Model (2012) defines student retention as choosing to continue in a nursing program and meeting the necessary academic standards to continue in a nursing program. The Model includes internal psychological processes and the effect these processes have on student success (Shelton, 2003). After completion of the Camp participants state a belief in themselves and more that 50% go on to finish their course of study and pass the licensure exam. These results are congruent with the theorists.

Research Design

The design of the study was descriptive qualitative with qualified applicants from the associate degree nursing program or practical nursing program from a community college in one southern state to explore the perceptions of Learning to Learn Recovery Camp participants. The researcher sought to understand the way the participants ascribed meaning to the experience of attending and completing the Camp and their perception of the benefit of the experience (Creswell, 2014). Additionally, a Learning to Learn Recovery Camp has not been implemented as a retention strategy in other schools of nursing. Therefore, a qualitative study is an appropriate research design for the current study (Creswell, 2014)

Sample

The sampling was a single stage design with a convenience sample of nine participants who completed the Learning to Learn Camp. Seven participants were successful after completion of the Learning to Learn Camp (graduated from program of study or currently in program of study). Two participants were not successful after returning to the nursing program of study and are enrolled in another nursing program of study.

Data Collection, Instrumentation, and Analysis

A demographic survey was used to collect participants' background information and characteristics. The investigator used an investigator-developed 10-question scripted interview questionnaire with open-ended questions to collect data. Data were collected until data saturation and themes emerged (Polit & Beck, 2012). The questionnaire was based on the research questions which explored the perceptions of the students regarding their needed areas of improvement and how the Camp impacted overcoming those weaknesses. Additionally, the questions focused on the perception of the participants achievement of their academic, professional, and personal goals. Answers to interview questions were recorded via digital audio and memos for accuracy of data. Data were analyzed by content analysis using open coding, categorizing, and connecting strategies (Polit & Beck, 2012).

The sample size was small and may not be representative of the population of all Learning to Learn Camp participants, but data saturation occurred through the interview process. Participants were from a convenience sample because they were volunteers who responded to the emails and phone calls and no students participated from the practical nursing program. The presence of the investigator during the time the participants attended the Camp might have influenced the responses. Findings were not generalizable because there are no other schools of nursing that conduct a Learning to Learn Recovery Camp for nursing students.

Results

Interview data were analyzed and findings presented as answers to five research questions. Participants' responses defined the themes. There were six themes describing the skills acquired in the Learning to Learn Camp, three themes for recognizing personal areas of improvement (weaknesses), four themes emerged regarding academic goal achievements, three themes emerged regarding professional goal achievements, and two themes emerged regarding personal goal achievements.

Discussion

The results of this study can be compared with the existing body of literature on student retention and attrition and the causes (Igbo et al., 2011). This study confirms and strengthens the evidence base by looking at the students who have been unsuccessful and the reasons given for the failures and eventual success with a nursing program of study (Jeffreys, 2015). Findings incorporate participant recollections of the Learning to Learn Recovery Camp and skills acquired in the Camp. Themes overlapped between the five research questions as the factors for being unsuccessful and the similar skills acquired in the Camp shaped perceptions of the participants. The overwhelming themes were (a) time and self-management, (b) organization, (c) self-assessment, (d) test-taking, and (e) faculty and peer support (Jeffreys, 2015; Dapremont, 2013).

Examples of acquired skills with participant responses.

Skill: Time and Self-Management

Academic:	*Participant J1:* "Had to learn time management during the camp with the assignments while in the camp. Either could be up all night or figure out how to do the work without staying up all night-use time wisely." *Participant T6*: "For one, time management. Something I thought I was really good at. That week was so pressed for time. I get everything done, but working ahead really helped me." *Participant A8***: "**I learned how to read material and actually pull what I needed to know from the material and not focus on the less important things."
Professional:	*Participant D7:* "I'm doing good with my time management, I was able to use it at work." *Participant D7:* "Time management and organization are like together. At work. I found a method at work to divide my patients."
Personal:	*Participant C2*: "I use time management in everyday life and in my personal life. Time management, I included my family in the time. I learned to give my husband time with an entire day."

Skill: Organization

Academic:	*Participant E5*: "Scheduling, my notebook organized where I can get to my notes and stuff like that, didn't realize how vital it is to be organized." *Participant K3*: "Prioritize what I need to be studying. Those subjects that I know more about, I do not study as much as those that I don't know as much about. Secondary or tertiary to what I need to be studying. *Participant A4:* "Now I make a schedule to study. I did not do that at all before. Ok, I feel like studying now and I would just study for 30 minutes and be done for the day. Now, I have set hours when I come home to study. Different ways to help me understand what I'm reading. Before I would have to read the pages over and over. Now I read it and if I don't understand it, I'll write questions from what I was reading before class and I go to the teachers after class and ask them, before I didn't do that. I didn't ask enough questions. Improved on that.
Professional:	*Participant K3*: "In my 1st two semesters, well actually first three semesters until Learning to Learn I did not grasp the concept of priority, now I almost use that word every day." *Participant D7:* "Time management and organization are like together. At work. I found a method at work to divide my patients."
Personal:	*Participant E5*: "For me it was the organizational skills. I came in. I knew that it didn't help but didn't realize how vital it is to be organized. Information before hand, in between, and after."

Skill: Self-Assessment

Academic:	*Participant C2:* "I was not adequately preparing for class. I do self-assessments every day and throughout the day." *Participant T6:* "Self-assessment in 4th semester, trying to figure out where I need to go. To reevaluate things. More of regrouping." *Participant J1*: "Self-assessment helped because we didn't really look at what we were doing wrong. You don't really pick up on things you don't do. Let me know I had not been doing things like I should. I did not spend the kind of time that was needed for classwork."
Professional:	*Participant C2:* "I do self-assessments every day and throughout the day. The camp helped so much that I use it so much naturally that I don't realize that I'm doing it."
Personal:	*Participant K9: "*On an emotional level, it taught me that I held onto a lot of personal stuff that I had going on with my family, more specifically my dad and I worried that if I kept suppressing that, I was never going to be the person I wanted to be." *Participant K9:* "To know that I have complete control over my happiness in my life and nobody else does. I was focused on personal goals that I needed to let go. I could be the adult I needed to be for myself and not for someone else." *Participant D7: "*It makes you feel like "I can do this." I didn't know I could be a good leader. At the end of the camp, I think I got lots of awards. I think I was like #2 on the highest score list. I didn't know that I could excel in that area." *Participant E5*: "The self-assessment versus the self-evaluation. Because I've been through a lot of stuff. Put that wall up because I've always been so critical of myself and I didn't realize, I knew it affected some relationships, but I didn't know how much of a wall it built and I didn't want anyone else to see how I criticized myself."

Skill: Test-Taking

Academic:	*Participant C2*: "Test taking-I looked at questions a little differently. Answer choices and key words. Used all the skills when I returned to school." *Participant K3*: "I learned how to breakdown questions, see the main scope they were asking for, get rid of the fluff of the questions." *Participant A4: "*When they broke down the questions, understand how they were thinking when they asked the question. Broke down every question. That was most helpful." *Participant E5:* "Test-taking was always hard because I can always get down to two answers. Of course, you always have the one that's the best answer. I always pick the wrong one. I've gotten better to recognizing the key words within the questions and answers as well. I didn't realize that before highlighting was a big thing for me, pulling out the key words. I try to answer the question before I look at the answers. That when I go through A, B, C, and D, I know when I look at it I'm pretty sure about it."

Skill: Faculty and Peer support

Academic:	*Participant C2:* "Support of instructors and how much I was loved and cared about. I was embarrassed when I came back that I had failed twice. I felt defeated. The camp gave me confidence and let me know that people are not calling me stupid. I formed bonds with people that I had to work with. I still talk to people from the camp." *Participant D7:* "When we were in class I couldn't feel that some of the teachers supported you and some of the class did not want you to succeed. I don't know why. They do that to you. I don't know. But in the camp, all the teachers are positive, all the teachers are so supportive, and you can just feel all the love. And even the students, we just accept each other more and we created like new friendships and I think a big factor is that your teachers support you and your peers support you, because it makes you feel like 'I can do this.'" *Participant A8:* "I'd have to say. The instructors and everything that was there, I felt they actually cared for me as an individual and they wanted me to meet my individual needs. It wasn't a whole, well this person is doing this. Focused on me. It makes a difference when we know you all actually care for us and you want us to figure it out. It made me want to actually come to learn. Learning to learn, it's terrible, it hard. It was a hard week, but knowing that you have people pushing for you, you don't have a support system at home, it makes a difference."

Conclusions

Results of the study indicated that skills within the Learning to Learn Camp are effective in empowering students to be independent, self-directed learners, and lead to student success. Success for the students is that they are able to complete their program of study and pass the licensure exam. Five of the participants in the study have completed the program of study and passed the licensure exam on the first write. Two of the participants are still in their program of study. Two of the participants are in another program of study at the college and state that the Camp empowered them to believe they will still reach their goal of becoming registered nurses. The strategy of a Learning to Learn Camp for nursing student retention should be employed at the school of nursing before entering the nursing courses. Additionally, this Learning to Learn Camp is the only Contextualized Recovery Camp in the United States of America and should be implemented in other programs of study.

Recommendations for Future Research

The initial recommendation is to conduct the research with a larger sample. Although data saturation occurred with the previous sample size, would the results remain the same with a larger sample? Learning to Learn Camps are designed not only for student growth, but also for faculty and facilitator growth and development. Therefore, future research should include: (a) faculty perceptions related to their (the faculty) skill acquisition as a facilitator of learning and (b) faculty perceptions of changes in student performance after students complete the Learning to Learn Camp. The participants who completed the camp and graduated from their program of study passed NCLEX® on first write. Additionally, future research should determine the relationship between students participating in a Learning to Learn Camp, program completion, and passing of NCLEX®.

References

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Development and Assessment of Professional Skills in Engineering Students: A Literature Review

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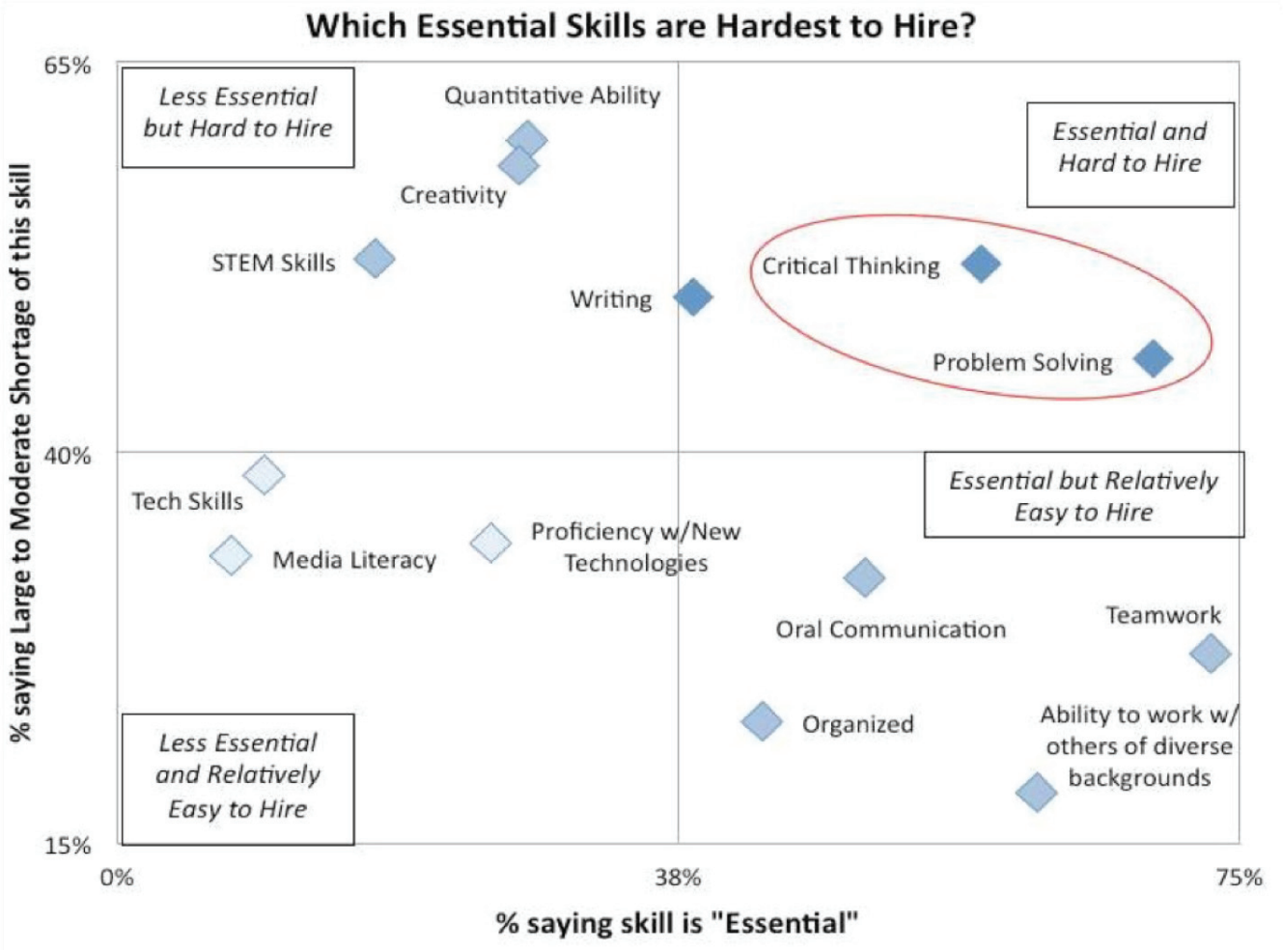
Abstract

Professional (soft) skills are as important as technical skills in distinguishing science, technology, engineering, and mathematics professionals for employment and advancement. A mid-2012 Millennial Branding Student Employment Gap Study revealed that professional skills topped the list of must-haves for employers. About 98% and 92% of employers stated communication and teamwork skills respectively are essential. Other top professional skills are creativity, adaptability, and leadership. The study aim at gaining knowledge of the fundamental theory or body of knowledge on the development of professional skills in students with the goal of highlighting approaches that can be applied to STEM students.

Introduction

Professional skills are as important as technical skills in distinguishing science, technology, engineering and mathematics (STEM) professionals for employment and advancement. The professional skills are known by different names [1] including soft skills, generic competencies, life skills, transversal skills, key competencies, 21st century skills, transferable skills, future work skills, key competencies for lifelong learning, emotional intelligence, and cross-

Figure 1: Difficulty in hiring skills [3]



cultural competencies [2, 3]. According to Thomas Industry Update [4], developing technical acumen is no longer sufficient for a successful STEM career.

In fact, according to a mid-2012 Millennial Branding Student Employment Gap Study [5], professional skills topped the list of must-haves for employers. As high as 98 percent and 92 percent of employers stated that communication skills and teamwork skills respectively are essential. The other three important professional skills to employers are creativity, adaptability, and leadership. The finding is in line with the Institute for the Future (University of Phoenix Research Institute) report on Future Work Skills 2020. Successful individuals will be those who can demonstrate foresight in navigating a rapidly changing landscape of organizational forms and skill requirements [6].

Figure 1 highlights the result of a study listing the competences employers deem most important to hire and the relative ease of finding a person with that skill [1]. Most of the professional skills are considered essential and only professional skills, namely critical thinking and problem solving, are considered both essential and difficult to hire by most employers interviewed [3].

The challenge is that these professional skills are often not learned in school. Consequently, many STEM graduates are not adequately equipped to navigate smoothly and effectively through different social and professional situations involving people of diverse backgrounds [4]. It therefore becomes critical that educational institutions include experiential learning that emphasize professional skills—such as the ability to collaborate, work in groups, read social cues, and respond adaptively [6]. The role of educational institutions and educators are not limited to equipping students with technical knowledge and skills for a profession. Their first priority should be the development of individuals who will become citizens who are able to actively and positively participate in the society [7]. Consequently, the Accreditation Board for Engineering and Technology (ABET) has six of its eleven student outcomes directly related to professional skills development [8].

Educational institutions need to focus on methodologies and techniques that will help their students in developing these professional skills that will make them remain relevant and useful in spite of the ever-changing and unpredictable world we live in. The professional skills they develop in their students will not only help them find and keep a job, the skills will also help them to flourish as human beings and achieve happiness in life [1, 9].

There are however barriers to the teaching these important professional skills, particularly in the STEM disciplines where faculty tend to be more comfortable with emphasizing the development of technical skills [10]. In addition, the high course load in engineering programs leaves little room to incorporate courses for the development of professional skills. The attitude that professional skills are not core to STEM disciplines as well as the limited experience of STEM faculty in professional skills development constitute additional hurdles [11]. Many STEM faculty find it difficult to clearly define the professional skills as well as develop rubrics to effectively assess their development [10]. They are unclear on how to integrate, teach, and assess professional skills in the curriculum [10, 12, 13].

This paper is a short literature review on some of the approaches and tools currently used for the development and assessment of professional skills. The paper is divided into six main sections, starting with the introduction. The second section presents ways to define and identify professional skills while the third section highlights different methods for developing professional skills in students. The fourth section focuses on methods and tools for assessing professional skills. The fifth section describes the implementation of institution-wide professional skills development initiative at university. The paper ends with the conclusion section.

Will the current Learning Analytics Data be helpful to solve the challenges of Gen Z's Education?

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Abstract

Learning Analytics focuses on the students and their learning behaviors, who appear less likely to succeed academically, and help them to achieve better outcomes. Generation Z (Gen Z) grew up with the internet, cell phones, iPods, etc. and they prefer to use visual methods for learning. They have characteristics such as saving money, shopping online, reduced attention span (only 8 seconds), preference for social media, and less skill for interpersonal face-to-face interactions. They prefer to communicate using icons, and imagery. By using the systematic literature review process, an effort is made to answer the question 'Will the current Learning Analytics Data be helpful to solve the challenges of Gen Z's Education?'.

INTRODUCTION

Learning Analytics (LA) is a new and quantitative approach for improving our understanding of the way students learn. It is defined as "the measurement, collection, analysis, and reporting of data about learners and their contexts for the purposes of understanding and optimizing the learning and the environments in which it occurs" [1]. Learning Management System (LMS) is used to enable educators and faculties to understand the learning behaviors of students and the learning issues that they face in their courses. This is done by collecting the massive amounts of data generated by the students while interacting with online learning activities. There are multiple kinds of data, such as Dynamic Student Data and Static Students Data. Dynamic Student Data depends on the students' activities during the learning process. This happens during the educational activities online on course discussion boards and the way they use the library resources. Static Students Data depends on the personal and on the academic attributes of students. Data Analysis can be done using various algorithms. The top five algorithms are Decision Tree (DT), Neural Networks (NN), Clustering-based classification, Rule-based algorithms, and Naive Bayes (NB) [2]. LA can predict learner performance, discover undesirable learning behaviors, and detect affective states (boredom, frustration, etc.) of the learner [6]. LA can provide insights into what is happening with the learner, and by using this the faculty can give suggestions to the students. It will help them succeed in implementing an intervention. This may probably include (1) A traffic signal indicator that is posted and displayed on the student's LMS homepage; (2) E-mail messages or reminders that are sent; (3) Text messages that are sent; (4) Appointments that are made with academic advisors, or academic resource centers; and (5) Personal meetings that are held with the educators [6] [4].

Learning Analytics has lots of benefits for students, faculty, and administrators, which can improve learning and learning techniques through providing feedback to individual students and faculty. Teachers can benefit from this approach by adopting their teaching techniques and customizing the material to better suit their learners. Hence, this helps to gain a better understanding of the learning process and improve it [3].

Generation Z, who are born after year 2000, is growing up with computer environments and the Internet [5]. They are also called Generation Glass, because they depend on iPads and screens on which they will learn rather than with pen and paper. LA are designed to be visual, not for displaying the written content. Gen Z can retain visual symbols and images rather than just written content. In fact, Gen Z prefers self-learning and visuals, and they are extremely technology savvy, smart minded, challenging, adventurous, active decision makers, talented, and have leadership skills [5]. They are quick in tricks and more enthusiastic to carry out the related and challenging tasks [7].

The Generation Z will create more challenges to the education. So, preparing to change our training approach to address the learning style that helps to attract them to education, research, and science will be beneficial.

This paper's primary objective is to develop a systematic literature review protocol to understand the many supports that the current LA provides to understand the learning habits of students, a thorough understanding of the learning characteristics of the Generation Z and the challenges they face. Also, an effort is made to identify the gap, if any, between the techniques that the current Learning Analytics provides and the way the Gen Z need to be educated based on their learning characteristics.

This research paper includes the following sections: Section II explains the background research papers that are used for this research review. Section III provides the detailed explanation of the methodology used in these papers, and Section IV presents the results of the study. Section V provides the conclusion of the study that is followed by the References.

II. BACKGROUND

Learning analytics is based on an interdisciplinary approach involving experts from the educational, statistical, technological and other domains [3]. With the growing use of Information and Communication Technology (ICT) based tools for the teaching and learning process, there is an ever-growing need for constant improvement of the devices, services, and the overall process to help students and teachers better overcome the challenges of learning [3].

Long and Siemens describe a multitude of benefits for using the learning analytics for education. Several of these benefits are focused at an administrative level, such as improving decision-making and informing resource allocation, highlighting an institution's successes and challenges, and on increasing the organizational productivity. They suggest that learning analytics can help faculty to identify at-risk learners early on. Also, it is important that faculty need to do interventions, and also transform their pedagogical approaches. This may help the students to gain insight into their learning. This suggestion is based on the data at hand and so using it effectively can allow us to achieve the benefits [4].

Generation Z relies heavily on the use of devices and computers because they have multi-functional abilities to watch a video, snap a photo, connect to the Internet, play games and listen to music [46]. Gen Z can access information anytime from anywhere. They depend on Social Media, and prefer self-educating through favorite websites such as YouTube and other online learning resources [46]. They are also prepared to make their own decisions based on the information at hand [8] [46]. Learners from Gen Z like to use game type activities to learn fast with the random construction of knowledge links, while dealing with visual and dynamic information with expertise [9].

The research paper in [7] provides details about how much influence the Learning Analytics has on Gen Z. It also provides fully integrated technology platforms with innovative learning practices to foster closer cooperation and collaboration between students and faculty. The authors believe that sharing ideas will lead to more successful open learning opportunities for Gen Z.

III. METHODOLOGY

1. Systematic Literature Review (SLR) protocol

The main focus of this paper is to develop a systematic literature review protocol for learning analytics with the objective of how learning analytics data can be used to solve the challenges of Generation Z. Also, the SLR process is a systematic step by step approach. It is an empirical evidence-based research that includes different search databases for finding out more evidence for the study. There are five main stages to be carried out when performing a systematic literature review: (1) Identifying the question, (2) Identifying the relevant work, (3) Assessing the study quality, (4) Summarizing the evidence, and (5) Interpreting the findings.

This study has followed all these five steps in conducting a systematic review study on LA and Gen Z to provide an overview to readers, based on the analysis of the results [6].

A. Review objectives and Questions

The answer to the primary research question: 'Will the current Learning Analytics Data be helpful to solve the challenges of Gen Z's Education?', the following sub-questions are formulated.

RQ1: What do the current LA provide?

Table 1 A brief description of inclusion & exclusion criteria applied

Category	Inclusion Criteria	Exclusion Criteria
Date of publication	Focus on articles published from 2010 to 2018.	All articles before 2010
Language	Focus on articles written in English	All non-English publications
Document type	International Conference, Journals and Workshop Proceedings	Short papers from conferences, text book, and book chapters.
Title Relevance	All titles that are related to the research.	All titles not related to research.
Research methods	Articles which provide qualitative results.	Articles that do not provide any qualitative or quantitative results.
Publication description	Focus on all related research in literature	All studies published only as abstracts or narrative reviews or letters to editors, and similar publications

RQ2: What type of conclusions can we get from the current LA about the course/student?

RQ3: What are the different challenges that the Generation Z face?

RQ4: What are the different solutions proposed to cope with the challenges?

RQ5: What are the different techniques or technologies used to overcome these challenges?

By answering these questions, the gap between the current learning activities and education that is needed for Generation Z can be obtained.

B. Search protocol

1) Keywords: The search was conducted by using different keywords such as 'learning analytics,' 'Improving education,' 'Data Analysis,' 'Generation Z,' 'Benefits of LA,' 'challenges of LA,' and 'challenges of Gen Z.'

2) Data Sources: The search process was mainly focused on digital libraries, and it was carried out using the following four databases.

- IEEE Xplore
- ABC Digital library
- Google scholar
- Science Direct

These databases provide more articles that can be used for answering the identified research questions.

3) Selection criteria:

- Inclusion Criteria: Studies that were published from 2010 to present, Studies that were included in the review process, workshop and journal, Studies that were published in English, Studies that provide qualitative information, and Studies that were based on reading the abstract and title.
- Exclusion Criteria: studies that are published in or before 2010 were excluded. Articles published in non-English were excluded. Studies that do not provide any qualitative or quantitative information and methods were excluded.

Table 1 presents a brief description of the inclusion and exclusion criteria applied for this review.

4) Quality Criteria: The quality criteria content for finding all the studies include the studies in the field of computer science, all the studies that provide a detailed description about learning analytics and generation Z, and all studies that are aimed at addressing the issues related to the current research questions. All studies, that do not describe the learning analytics and Gen Z or studies that do not achieve good results are removed. Fig.1 depicts the overall representation of the systematic literature review process.

C. Data Extraction

After collecting papers from various databases, the research process aims at selecting the relevant

papers for this literature review. Fig. 1 shows the details of the 959 papers that were collected. After applying the exclusion and inclusion criteria, 490 papers were then dropped because they were duplicate papers. The next criteria applied was based on the years. In this process, 219 papers were removed. Next, the criteria was applied based on English and another 31 papers were rejected. In the next step, 54 papers with unrelated titles were removed. The final process was about identifying the relevant abstract, and in this process, 111 documents were excluded, and finally 54 studies were obtained. The screening process is shown in Fig. 1.

IV. RESULTS

A number of studies that are relevant to the review were collected, based on the systematic literature review process carried out in this research after data extraction. The results of the studies helped to answer the research sub-questions identified in the SLR process, are provided. Massive studies of learning analytics and generation Z were published after 2015. Fig. 2 shows that there was an enormous increase in the number of papers published from the year 2010 until 2017. Also, Fig. 2 shows that there was a sudden increase in the number of papers in 2016 and 2017 compared to previous years from 2010 and there was decrease in the papers published in this area in 2015.

Fig.3 shows the number of papers published on LA and Gen Z among different countries identified after conducting the study. USA is at the top of the list and has published a total of 7 papers based on the data. Next comes Spain and Canada that have published five papers each. China published four papers. Australia published three papers while Japan, Turkey, and Slovakia have published two each. India, Morocco, Macedonia, Portugal, South Africa, Bulgaria, Sri Lanka, Belgium, Croatia, Bangladesh, and UK have published one each. Also, there were 13 research papers found online.

A. RQ1: What do the current LA provide?

Learning Analytics provide major approaches [16] that depend on the various factors, which are given below:

1. Techniques for Modeling such as Attention metadata, Learner modeling, Behavior modeling and User profile development.
2. Relationship mining such as Discourse analysis, Sentiment analysis, A/B testing, and Neural networks.
3. Knowledge domain modeling such as Natural language processing, Ontology development and Assessment (matching user knowledge with knowledge domain)
4. Applications for Trend analysis and prediction such as early warning, risk identification, mea-

Fig 1 The Screening Process

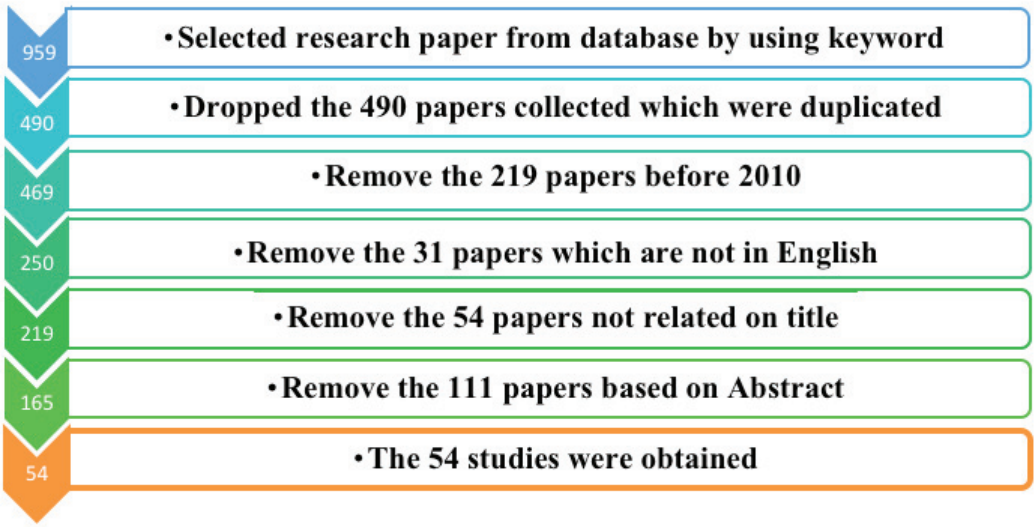


Fig. 2 Number of papers published by year

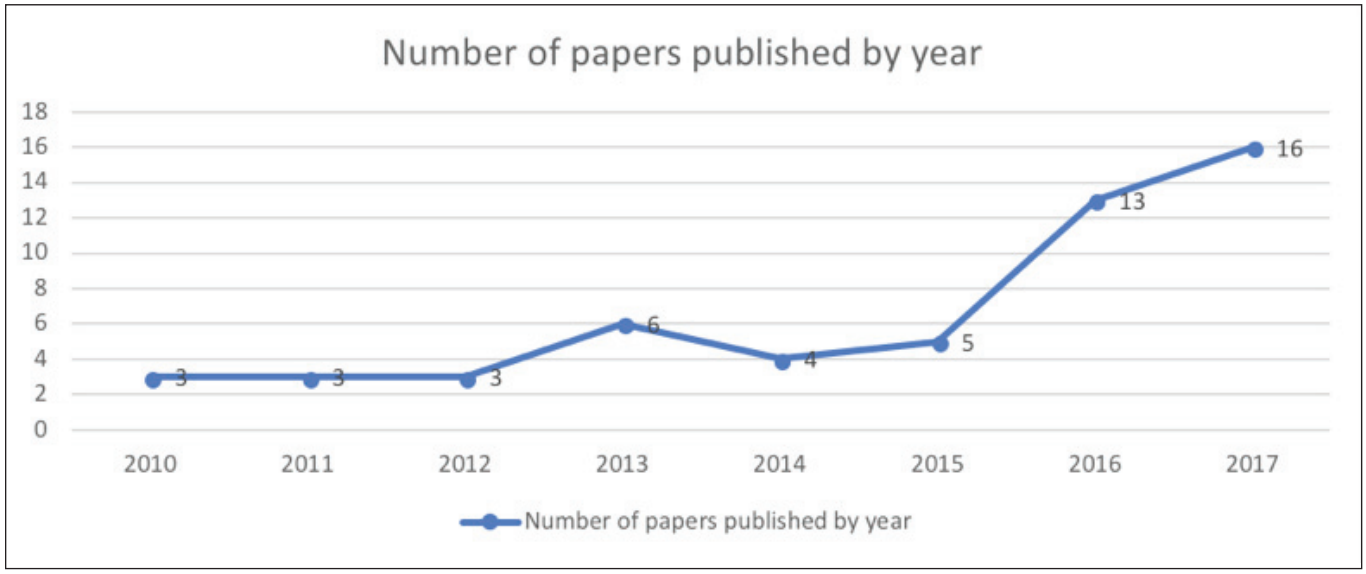
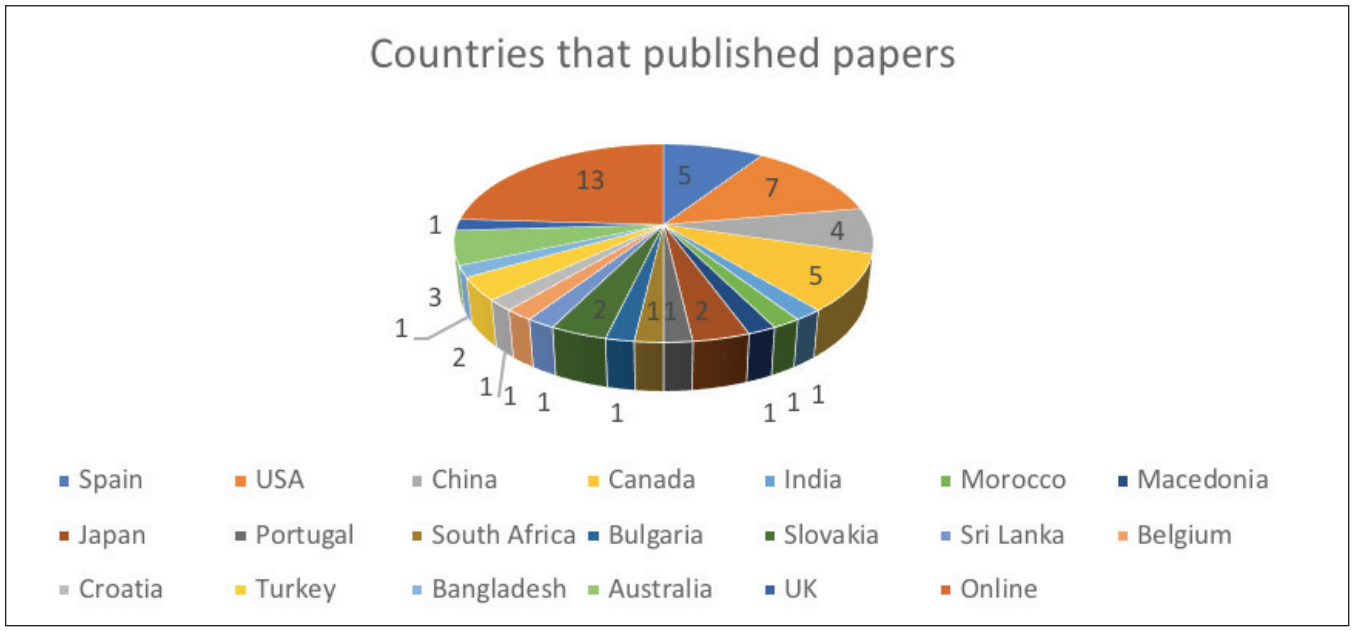


Fig. 3 Count of papers published by different countries



suring the impact of interventions and changes in learner behavior, course discussions and identification of error propagation.

5. Personalization/adaptive learning such as Recommendations, content and social connections, Adaptive content provision to learners and attention metadata.
6. Structural analysis such as Social network analysis, latent semantic analysis and Information flow analysis.

Also, LA provides many techniques that help to improve education. Table 2 presents all the technologies that were useful for this research review.

Table 2 Technologies used for this research review

Category	Example	Description	References
Technology and Techniques	Social Learning Context Analytics (SLCA)	Context analytics are the analytic tools that display to the benefit of who seek to understand the contexts. These analytics may be used alone, or may be employed as higher-level tools pulling together data produced by other analytics.	[16]
	Social Learning Disposition Analytics (SLDA)	Learners who would like to learn and detect new ideas make good use of these resources and tools. These dispositions can be used to recognize the visible group with a mixture of experience, motivation, and intelligence that offers an individual's capacity for lifelong learning and influence responses to learning opportunities.	[16]
	Sentiment Analysis (SA)	SA analyzes the opinions, reactions, impressions, emotions, and perspectives. Its algorithms can extract and assess information from huge text databases and summarize it. One aim of sentiment classification is to identify whether a text is objective or subjective, or represents a positive or negative opinion. Affect classification is used to determine the expressions of emotion such as happiness, sadness, and anger.	[16], [15], [54]
	Parallel Particle Swarm Optimization (PPSO)	A mechanism to analyze and predict a dynamic learning path for learners based on competence in a learning environment. Also, PPSO algorithm is used to enhance the learning processes, support self-regulated learning and boost learners' success rate.	[29]
	Eye-Tracking and Robust Intelligent Tutoring System	Eye-tracking is a technology that captures the real-time data of the learners. The system offers adaptive learning by providing customized feedback to the learners.	[44]
	Sequential Analysis (SA)	Sequential Analysis is the examination of the behavior of teacher instruction as to whether it increases or decreases the probability of another behavior. The method helps to advance Learning Analytics in Online Learning Environments.	[22]
	Self-Regulated Learning (SRL) skills.	Learning regulation is a continuous monitoring technique. The students set their objectives and attempt to monitor, organize and control their thoughts, motivations, and behavior in line with those goals.	[30], [35]

The application tools and the contents are given in Table 3.

Table 3 Applications Tools

Category	Example	Description	References
Technology and Techniques	A Pedagogical Model for Intervention with Embedded and Extracted Analytics	A pedagogical model translates the concepts and results of the research program into guidelines for practice and analytics. Both students and instructors can evaluate their discussion, participation, and if the students were present in class or not. This is used to develop analytics both embedded in and extracted from the learning environment to improve these activities, and explain a pedagogical model for the analytics intervention based on the principles of integration, variety, parity, and dialogue.	[17]
	Multimodal Learning Analytics (MMLA)	MMLA captures, compiles and analyzes learning traces from a variety of sources to obtain a more holistic understanding of the learning process. MMLA benefit the increasingly widespread availability of several sensors, high-frequency data gathering technologies, sophisticated machine learning and artificial intelligence techniques.	[48]
	A big data architecture	The goals of the system are an attempt to combine the generation, acquisition, cleaning or pre-processing, storage management, analytics, visualization, and alerts.	[43]
	Artificial Intelligence Techniques	Assess human learning in text analysis and emotion detection.	[12]
	Social Learning Analytics (SLA)	SLA process is a subset of learning analytics. It is used to describe the learners' interaction on the online discussion forum in Moodle by analyzing the learners' participation in various synchronous and asynchronous online learning tools. They are developed and transmitted by the interaction between them.	[41], [16]
	Social Network Analysis (SNA)	SNA is the measuring of the relationships and the flows between people, groups, organizations, computers and other connected information/knowledge. It contributes to the achievement relations, roles, and network formations.	[15], [30], [16]
	Social Learning Discourse Analytics (SLDA)	The connection between the learners in a network through use of dialogue between them is used by SLDA. These interactions can be studied using the different forms of discourse analysis that display ways of understanding the large amounts of text generated in online courses.	[15], [16]
Application	Learning Management System (LMS)	The application is concerned with the administration, documentation, tracking, reporting, and delivery of educational courses or training programs. This allows faculty to know how students proceed through a course, track performance, predict student success, deliver material to the students, administer tests and other assignments, and save records. LMS depends on online learning and blended learning.	[4], [26], [18] [6]
	Recommender Systems	The system depends on the experiences stored by students who have taken the course before, and the competency levels achieved by a student in the same current course through analyzing information.	[53]
	Attention metadata	Attention metadata is based on collecting detailed information to describe how people interact with information such as what they read, watch, listen to, and publish in different contexts. The collected data includes information that enables to conclude on the user's preferences, context, dislikes, goals, and interests. Attention metadata provides the ability to represent data about the activities of a user within a particular environment. Concentration becomes the scarce factor, both on the side of learners as well as on the side of teachers.	[52]

Table 3 Applications Tools (con't)

Category	Example	Description	References
Application	Massive Online Open Courses (MOOCs)	MOOC is the development of distance learning platforms to provide free knowledge. These platforms contain a number of courses for different specializations. There is an increasing demand for more specific learning resources and assessment methods to evaluate the progression of students.	[21], [42]
	Intelligent Tutoring System (ITS)	A computer system that aims to provide immediate and customized instruction or feedback to learners, usually without requiring intervention from a human teacher.	[31], [42], [44], [47]
	Video Games/ Serious Games (SGs)	SGs are games used to educate, train and inform. It considers the most interactive learning environments where players /learners can learn, prepare or inform themselves based on the learning objectives by playing the game. SGs display players' interactive content, significant degrees of control, freedom of movement and responsibility for the actions undertaken.	[14], [49], [18]
	Remote Laboratory Management System (RLMS)	A remote laboratory is a software and hardware tool that enables students to use real equipment in an educational institution across the Internet.	[24]
	EdX platform	The edX is a massive open online course (MOOC) provider, and is one of the essential MOOC platforms. EdX's current support is for learning analytics.	[21]
	Facial Action Coding System (FACS)	This system helps to recognize the student's affective state by observing and coding their facial expressions and applying machine learning to the data produced. This application can be used on the spoken dialogue to distinguish the states of boredom, frustration, flow, and confusion, especially when students interacted with AutoTutor.	[12]
	Early Warning Systems	The system depends on student data to identify the students whose behavior or academic performance make them at risk of dropping out of school.	[51]
	Recommender Systems	A recommender system is a subclass of information filtering system that seeks to predict the "rating" or "preference" of a user. The system provides an overview of intelligent information that support access to highly dynamic information resources. Recommender systems in education are used to support the teaching-learning processes. These systems help facilitate and take advantage of the social knowledge in competency-based and blended courses.	[53]

B. RQ2: What type of conclusions can we get from the current LA about the course/student?

The types of conclusions that can be obtained about the course/student from the current LA are given in Table 4.

C. RQ3: What are the different challenges that the Generation Z face?

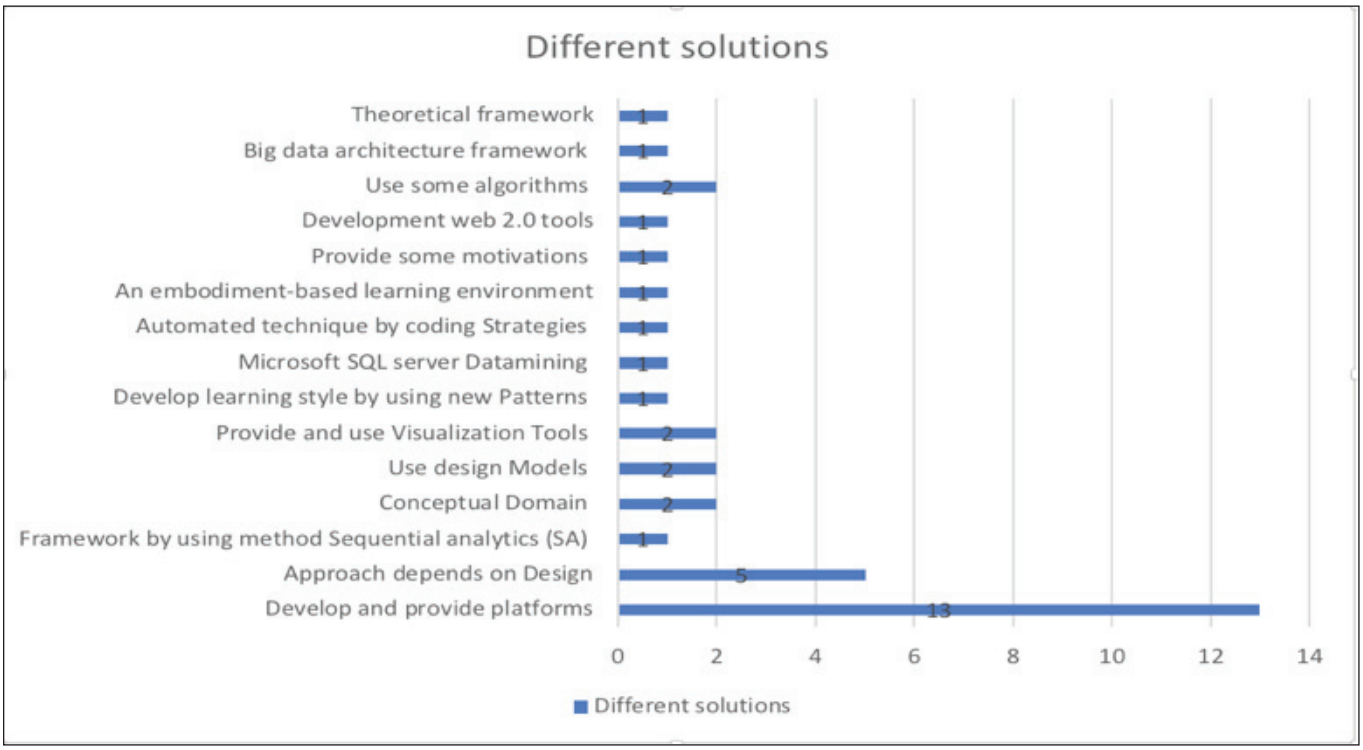
There were different challenges faced by the Generation Z.

1. Dependency on technology lowers their communication skills which include verbal communication skills, public speaking, lack of expression, confidence and interpersonal skills.
2. Short attention span leads to becoming bad listeners.
3. Dependency on technology by using online resources such as Google or YouTube for academic purposes. This behavior may lead to lack of attention in the classes because they are confident that they can obtain the information on their own. Also, they may be unable to perform simple tasks.
4. Lacking on the development of critical thinking skills because they get information at lightning speed.
5. Visual preference on using the web to socialize, play, or watch videos.
6. The gap between the skillsets they formally learn in school compared to those required of them in the industry increases.
7. Prefer to connect via text, chat, Facebook, or games.
8. Conflicting information: Does not listen (convinced) what teacher says, and so go online to

Table 4 Conclusions from the current LA about the course/student

Sl. No.	Description
1	LA personalizes and adapts by providing students unique learning pathways that are best suited to their interests or assessment materials.
2	LA provides flexibility to learn by helping students to know their academic progress in near-real time, without waiting for midterms or final exams and inspire them to take a more active role in their learning.
3	Students can get feedback and clear goals about their performance to improve their results.
4	Helping educators with information to intervene and to support students by using automated textual analysis of messages sent to online tutors. Using discussion forum of student access may help in discovering areas where students are struggling.
5	Collected data from analytics might help institutions design better courses.
6	Providing a suitable learning environment for students by the display of new content through technology, either via videos, interactive apps, or content-rich websites which help students better prepare for the future success.
7	Giving integration of interactive multimedia and what the students need to feel, hear, see, touch, and experience about their lessons that would allow the students to follow their curiosities.
8	Providing multitasking for students by engagement in creativity and collaboration, whether it is spontaneous or structured, that may provide more creativity in the classroom.
9	Having more opportunities for hands-on learning and using more technology in the classroom may help the students to become more creative in the classroom.
10	Speed in obtaining information by providing more digital tools that may help students to apply more creativity in the classroom.
11	Deliver quality learning experiences through a mix of channels at home and access to a greater variety of tools and platforms that allows students fast delivery of content, data, and graphics.
12	LA provides support for applying the course materials to refine assignments and highlights in the course syllabus to communicate a more contemporary approach to learning.

Fig. 4 Different solutions proposed in the primary studies selected



find information; much information available online and will get confused.

9. Gen Z students prefer to learn best by doing/creating.

D. RQ4: What are the different solutions proposed to cope with the challenges?

There were different solutions proposed to cope with the various problems in the primary studies selected from the literature. Fig. 4 shows that the 'development and provide platform' is considered as the most important solution.

E. RQ5: What are the different techniques or technology used to overcome the challenges?

As shown in the Fig. 5 there are different techniques or technologies that were used to propose the new solution to overcome the challenges. Gamification is the most important technologies used. The next most used method was LMS, which provides comprehensive tools for teaching in new ways. Then, MOOC and Web 2.0 were the tools and methods that provide a set of opportunities for knowledge sharing.

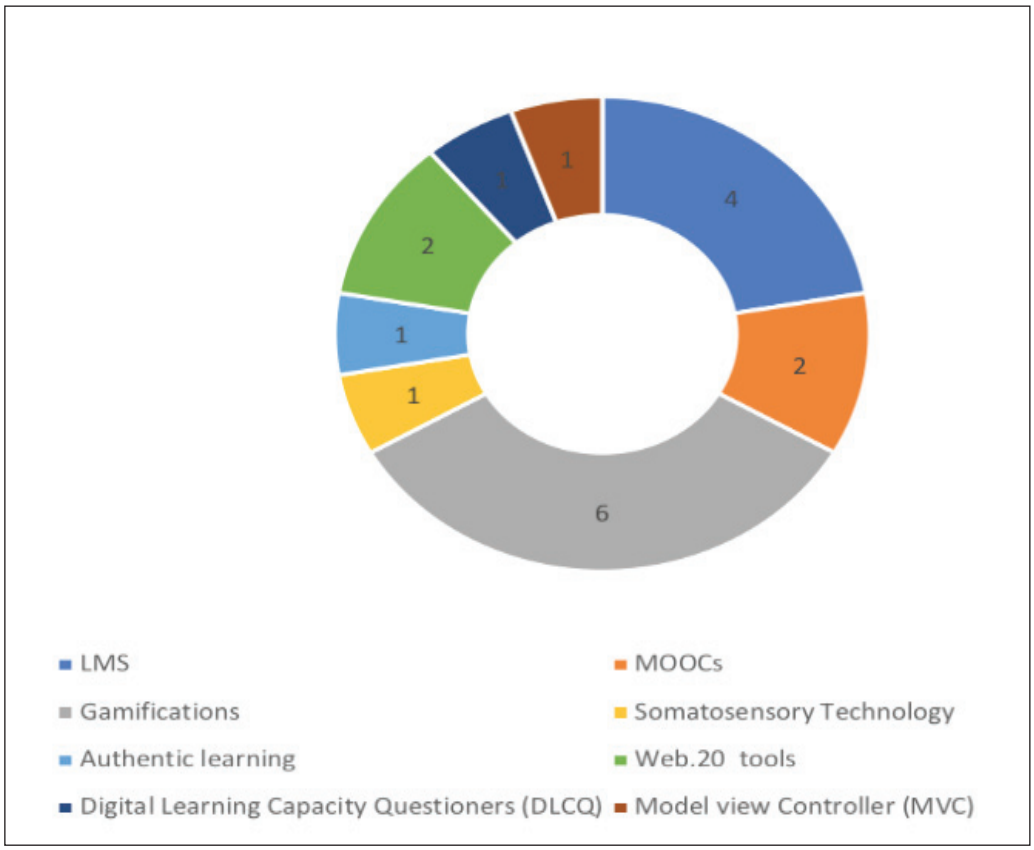
V. DISCUSSION AND ANALYSIS

Learning analytics is considered as the fundamental technology nowadays because it helps many universities to improve the performance of students who may otherwise fail, especially for those in generation Z, who are completely dependent on technology all the time.

The objectives of this SLR protocol are to find out the capabilities of the current learning analytics and the way Generation Z learns. An effort is made to find the gap between the existing learning activities that could be analyzed by the current LA tools and the ones actually needed for Generation Z. In this research, the SLR protocol was used to provide an answer to the primary research question: Will the current Learning Analytics Data be helpful to solve the challenges of Gen Z's Education?

From the five research questions that were identified, the answers were provided for the first one using many of the techniques suggested in literature that may help to improve education. Table 2 presents all the technologies and applications that were used for this research review. Also, each type of

Fig. 5 Different techniques or technology used to overcome the challenges



technology and application are described in order to clarify the importance of each of them. The second research question illustrates how LA positively affects students and courses through a review of this technology that leads to creativity and improves the course materials. The third research question was answered by explaining many challenges that the Gen Z faces and how technology plays an important role in this generation.

The fourth research question was answered by analyzing various technologies that were used in the proposed solution to cope with the different challenges that Gen Z faces. Fig. 4 shows that the development of platforms is considered as the most critical solution, which has the highest ratio. This approach depends on the design. Hence, it is clear to us that how important are the visualization tools for the Gen Z. There are many types of platforms such as aggregation, social, mobilization, and learning; and all of these can help to improve education.

The final research question illustrates many fundamental types of technologies and applications that are preferred nowadays. Fig. 5 shows that there were many different techniques or technologies that were used to propose the new solutions to overcome the challenges. Gamification was used a high percentage that was shown for these technologies in the primary studies selected. Gamification is becoming popular worldwide to educate. This innovative approach started to gain traction and attention, and is considered as an alternative to teaching. The gaming lifestyle of Gen Z displays an opportunity to discover if gamified pedagogy can be a solution for encouraging students to study. It is also used to support the learning process by helping teachers to track their students for any learning goal through monitoring players activity from the data. So, gamification can provide an advantage to LA systems. The next most used method was LMS which is considered the most essential technology used, and provides comprehensive tools for teaching in new ways. Then, MOOC and Web 2.0 are the tools and methods. The third most important technology that gives a set of opportunities for knowledge sharing is by using various social media. All of these are considered as innovative ways to attract students, especially Gen Z. These are achieved through having

a set of critical elements for effective teaching that includes clarification, instructional variety, teacher task direction, involvement in the learning process and student success average. Then, these will help Gen Z to be more aware of where they stand in their educational path [40], [49], [23], [33].

However, an important element that should be mentioned in this research is the faculty members. A recommendation for faculty is provided for helping the students and having communication with them. This will contribute to improving the education. A good relationship between the faculty and the students will increase the success rate, and hence foster teaching by making faculty adjust the speed with the learning needs of Gen Z. It is better to understand what learning ways they prefer so that the technology tools could be embedded accordingly. Generation Z depends on technology as the major way of communication. So, faculty shall integrate information using technology for a course rather than using a traditional textbook and is provided in the learning management systems. Faculty shall make short lecture sessions and create interactive videos by using technology tools such as YouTube that students can watch at their leisure. Faculty shall give assignments to students that are obvious in a lesson plan or project by explaining how these could help students to make a difference in their lives and the communities. Faculty shall explain how working in groups, and collaborating online will help students. Faculty shall help students to select online resources and they can illustrate what sites need to be identified that would provide the most credible and unbiased information [3], [46].

VI. CONCULSION

The systematic literature review presented here provides an effort to understand whether the use of current LA would overcome the challenges Gen Z faces, and they would be successful in their learning. The results of the systematic literature review of studies are presented. Detailed explanation is provided for how the learning analytics can play an important role in personalized education, pedagogical practices, curriculum development, institutional planning. Also, how digital native learners prefer to do many tasks related to technology such as listening to music, talking on smartphones, playing online games, providing quick replies to messages and use game activities to learn fast. This review also presents how LMSs can be used by students to access many opportunities such as the ability to collaborate with other students and their teachers, and to use the spaces where they can complete their academics.

Based on the results of the study, it is revealed that the effectiveness of technology-based learning groups is better than the traditional learning groups. Also, analysis of learning shows that it is better to use the visual aids and hands-on learning styles rather than an auditory form, which has traditionally dominated the classrooms until now [40].

This study has found few limitations on the currently existing learning paradigms and are addressed here. First one is that the data privacy is a difficult problem facing the learning analytics. Using the student data for analytics brings up many privacy issues. Despite technical solutions, there are still complexities in preserving confidentiality. The second one is that the faculty members are more comfortable with old ways; they don't want to change or switch to adapting technology. For example, instructors prefer to teach with expensive textbooks instead of online materials available from libraries or websites. So, faculty and administrators need to take a step back and become more flexible with using the technology and allowing the faculty to apply technology, and understand why it is essential. There is no doubt that faculty should be prepared to teach using a set of software, hardware, digital tools, technological platforms, and social media. They will need professional development to support them to move from a traditional approach to a transformational learning and teaching model [1], [40].

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CBI Lobby
1:00pm

Generation Z: An Inside Perspective

Breanna Apple, Rensselaer Polytechnic Institute

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=189

OVERVIEW

Facebook. YouTube. Twitter. Instagram, Kik, Snapchat, Vine, Tinder; the list goes on. While it might seem at times like these services popped up just yesterday, for many members of the so-called "iGeneration," it's difficult to remember a time without them. The world wide web existed long before the oldest members of Generation Z were born—and now these oldest members are beginning their college careers, with new technologies in hand and new ideas about the way the world works. What makes this generation different from the media darlings we know as Millennials? How does the constant presence of social media affect the way twenty-first century kids form and maintain friendships? What can modern technologies do for a classroom, other than serve as distractions? What does the iGen value? Why do we love technology so much? And what do all of these strange new words mean? In this talk, I will attempt to answer these questions--and other questions that may arise—and to provide an overview of how a Gen Z lives and learns from an insider's perspective.

Notes

Top 10 i-Gen Tools for Teaching/Learning

CBI 300
4:00pm

Facilitator: Breanna Apple, Rensselaer Polytechnic Institute

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=124

OVERVIEW

For members of Generation Z, the idea of a world without internet is a foreign one. Growing up with Google at your fingertips makes concrete sources of information – books, newspapers, journals – seem inefficient and dubious. The advent of instant messaging has made phone calls an unfortunate and uncommon necessity. Handheld calculators are quaint, handwritten essays are painful; nevermind letters – even emails are slow these days! But what technologies have stepped in to fill these gaps? This workshop will provide a quick overview of twenty-first century tools and the ways we use them, and participants will brainstorm ways to integrate these tools into the classroom, in the hope that these new technologies can serve as more than just a distraction.

LEARNING OUTCOMES

- Become aware of the top technology resources preferred by iGen students
- Understand the iGen mindset better through their choice of tools
- Learn a new tool that you will present to others

PLAN

1. Break participants into teams of 3 to 4 with diverse technology skill sets.
2. Play Family Feud (15 minutes) - Guessing the iGen choices for the first 7-8 minutes
    - Most popular messaging service
    - Most popular social network
    - Most popular media platform
    - Preferred way to learn class material
    - Preferred way to get critical class information
    - Best way to motivate a college student
3. Assign tools to investigate (10 minutes)
    - Each team brainstorms a list
    - Inventory items across teams and then add from Breanna's experience
    - Choose either a computer based or mobile platform based tool to explore
    - Assign tools based on team ranking in Family Feud

PLAN (con't)

4. Tool Exploration (20 minutes)
    - Learn the tool
    - Identify why iGen students value this tool
    - Propose three ways this tool enhances learning and teaching
    - Describe what characteristic in the iGen mindset connects with this tool
5. Sharing Discoveries (35 minutes)
    - Teams take turns illustrating/summarizing their tool, demonstrating a context for using the tool in teaching/learning
    - Quick round of Q/A
6. Final Thoughts by Breanna (5 minutes)
7. Complete Session Assessment Form (5 minutes)

Notes

Sharing Teaching/Learning Innovations with IGen

205 BISL
4:00pm

Facilitator: Matthew Watts, Tidewater Community College

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=130

ABSTRACT

This session includes papers that enhance understanding of academic risk factors of incoming traditional age students on college readiness, programs that are targeted to provide for college readiness of these students, and approaches in first-year experiences that innovate to reach this new generation.

Note that abstracts only are included if full papers were not available as of May 1. Papers for this session are exerpted if longer than 8 pages in length. Full papers may be found online in the resources available for this session.

PANELISTS

Notes

Project-based learning as a tool for becoming a self-learner

Davide Piovesan, Gannon University

Abstract

Project-based learning (PBL) presents students with a research problem that does not have a well-defined solution forcing them to become critical thinkers. It forces the process educator (PE) to understand different learning styles and to focus on the goal of the project rather than the final product. Based on the learner intellectual maturity the PE guides the learner using different task delegation levels. This process encourages and enables the learners own analysis while making "decision" a shared process. The final goal of PBL is for the student to be trusted to assess the situation and options acquiring enough competencies to decide and implement a solution.

Introduction

Don't judge an individual by the answers s/he gives you but by the question s/he asked. This is an old adage of the French philosopher Voltaire. Pedagogues are often so obsessed to provide knowledge that it is often forgotten students are not sponges ready to absorb any kind of information provided to them. Pedagogues have to rather stimulate the student's curiosity and foster their critical thinking. Most of college students qualify to drive a car, vote in a political election, buy a firearm and should be able to take educated decisions that are important and have direct consequence on their life and the life of others. What we usually observe in students is their sudden panic when a set of incomplete information is given to them in order to solve a problem at hand. Students often believe that all the specific information should be provided to them in order to solve a problem. It is a common belief among students that, if they make an assumption that is not what the professor wants, they will be penalized in some sense. What pedagogues should highlight to the student is that incomplete information and uncertainty is actually the norm in decision-making in the industry.

Using project-based learning is a very good tool to teach the students how to be self-reliant and learn in an environment that forces them to gather information to complete their task. Project-based learning allows touching all the hierarchical levels of the Bloom's taxonomy scale.

Bloom's taxonomy [1] proposes a hierarchical structure that delineates the different educational learning objectives of the learner associated to the different phases of learning. The most basic level of learning starts with remembering facts. The students at this stage just absorb the information and can retrieve it from their memory. The next step is to understand the information that has been provided to them. This requires the creation of a mental construct. This makes the case for the use of tools such as frontal lesson, where concepts are explained, and hands-on experiences, where the information is put into contest. As their competence increases, students are able to analyze a problem deconstructing the whole into smaller chunks. The next step is to applying such information associating it with contests not seeing before. We speculate that this is the most common educational learning objective level of undergraduate students. The additional steps such as the evaluation of where a decision needs to be justified and a thesis defended is seldom touched upon, let alone the final level of creative thinking, where new ideas are synthesized. Indeed, the evaluation level is more often reached at the Master level, where the student is supervised and his/her assumption questioned by their mentor. The autonomous research and unsupervised creation is usually seen at the Ph.D. Level. The level of creating something new requires two put together all the previous knowledge and the capability to process such knowledge. The culmination of the process is the creation of an artifact, a theoretical work, or a piece of software to just name a few example applicable in the STEM fields.

Project-based learning somewhat reverse Bloom's Taxonomy pyramid by starting at its top with the creation of an artifact, working in the evaluations of different options and the analysis of knowledge as it applies to different contests. In the contest of senior design projects, oftentimes the work done entails group-work where students are tested on

how they are able to interact with each other. Often, it is possible to obtain good results as far as the creation of a good artifact or a good final paper but group dynamics is quite important. We can often be in the presence of a dysfunctional groups where a very driven individual does the majority of the work while the others have no idea what's going on the whole time, disappear at the very beginning and do not show up until the very end or say they're going to help but they're not.

More than the results, in a project it is important to focus on the process to obtain such results. A good example to illustrate the problem is the certification of wine in different countries [2]. In the US wine is certified for what it contains, for example the quantity of tannins, the alcohol content, the acidity, the concentration of sulfites just to name a few parameters. On the other hand, in many European countries wine is not certified for the content but for the process utilized for producing it. A wine cannot be called "organic" only because it contains "organic grape" because the process can adulterate the content. A good process allows for a good product all the time. A systematic process is concern with how the results are obtained and this should guarantee the obtainment of satisfactory results independently of the individuals.

Group Dynamics and Crisis Avoidance

Classical group approach entails a single report from the group and a generally strict division of roles within the group. The management of disagreements is often done by the advisor only when the group is not able to solve a problem anymore and unnecessary frictions have already being seen. In-groups disagreements are often solved by whoever has the stronger personality within the group. A different strategy for group work can be taken from police and military units. A group should not be larger than three or four individuals. Each group should be assigned a single project which is equivalent to a mission to be accomplished. Within a military unit we do have specialized individuals but they are still responsible for understanding the whole mission. In the same fashion groups could have specialized individuals, for example students from different majors, but it is important that every individual understand the whole mission. What often happens in military and police units is that after the mission all the individuals are responsible to turn in a personal report. This method has several advantages. While this method makes more work for the instructor given the larger number of report to grade, it actually allows each student to provide their point of view. This oftentimes makes them feel valued and reduces disagreements.

Steps for an effective delegation process

Project-Based learning is successful if the instructor is able to assess the level of intellectual maturity of the group components and actuate a proper delegation process. Following the steps for delegation process are presented in the contest of a senior design course [3].

The definition of the task/project in the mind of the instructor. Often the instructor is affected by what is often defined as "the curse of knowledge" [4], a cognitive bias that makes the instructor unknowingly assuming that the students have the background to understand the concept. Thus, the definition of the task is paramount. The instructor must confirm in his own mind that the task is sustainable to be delegated. If the task is a creative process, the advantage is that the instructor is also presented with something new. This reduces the "curse of knowledge" because the instructor is now seen more as a "grass root" leader rather than an autocratic Sovereign. The project is not seen as an imposition (extrinsic learning) and tries to foster the autonomy of the students and their motivation (intrinsic learning) [5].

Selection of the individuals in the team is also very important. It is well known that individuals who are motivated in achieving the specific task are much more productive. Thus, it would be useful to find a project that is either initiated by the students or that resonates with them so that they are not forced to work on a project that they might not find interesting. What is often forgotten is also the engagement of the instructor. What is the instructor going to get out of it? This question makes the instructor to also put some skin in the game. Projects can be related to the instructor's research, and collaboration with the students could provide new scientific publications or interesting new applications.

Assess ability, training needs, and resources. Students need to understand what needs to be done. As described above, this ability is relatively low in the Bloom's taxonomy pyramid and it is often achieved in undergraduate students. However, the instructor needs to dedicate sufficient time to make sure that the objectives of the project are clear. Often, specific training needs arise that are not covered in the curriculum, and needs to be provided to a group rather than to a class. These needs might include training on specific engineering software or access to specialized literature. This is where support departments such as the library and the specialized centers for education in technology should be leveraged.

Explain the reasons for the project. People don't buy what you do; they buy why you do it [6]. This famous quote from Simon Sinek explains very well why motivation is extremely important for achieving the final results. This is often achieved by relating the goal of the project with the personal experience of the individuals. In the case of biomedical engineering, many students have a relative with a specific health condition and want to make a direct contribution to help. The students participate because of a personal interest, the task is valuable and it inspires a sense of autonomy. The reason for the project (why) and not specifically the result of it (what) is a much more powerful tool to make student self-empowered. The belief of the students that they can make a difference reinforces the belief in incremental intelligence. The incremental view of intelligence treats intelligence as malleable, fluid, and changeable [5]. The student gain pleasure from the process of learning because it is directed to a higher good. Students with this view tend to focus less on what the outcome will say about them, but the difference they can make for others.

State required results and deadlines but focus on the process. The instructor must make sure the students know how s/he intends to decide that the job is being successfully done. On the other hand, what count the most in a project-based learning experience are not the final results but the process the students go through. If the task is complex there might be unexpected delays. Thus it is important for the students to understand what the priorities are and what is important as compared to what is urgent [7]. The process can be exemplified with everyday tasks that the students are familiar with, such as baking a cake. Almost all students are able to state that for the preparation of a cake, all the ingredients need to be at hand; that the oven needs to be pre-heated; that the dry ingredients need to be mixed first and liquid ingredients need to be added gradually to not create clumps. These simple examples can be easily generalized to the project where all the calculation on material strength need to be done before choosing the material; that the materials need to be ordered before manufacturing and so on. Milestones need to be agreed upon so to keep students accountable, but they also show them that the job can be done, helping reinforcing commitment.

Feedback: on learning or on results? We know that feedback greatly affect motivation. Keeping motivated when you actually get feedback that says you are not doing well depend on the theory we have about intelligence. If we second the "entity theory" [8], that is, if we assume that intelligence is set in ourselves and is unchangeable, receiving feedback that you haven't learned something might be disruptive. If the failure is seen in the ability to learn and such ability cannot be changed negative feedback becomes detrimental for motivation. If we instead second the "incremental theory" which assumes that intelligence is incremental and based on acquired experience we would tend to interpret the negative feedback as signaling something about the effort or strategies that can be changed. If you believe you can change overtime, you will.

So what can the instructor do for the student to become more intrinsically motivated in learning? Following we propose some examples [5]:

- Avoid controlling language. Focusing on the students happiness and satisfaction rather that pleasing someone else (e.g. the instructor)
- Create opportunity for meaningful choices
- Decrease supervision and monitoring

Levels of Delegation

Following, we propose a commentary on [9] describing the different steps an instructor can take

to gradually decrease supervision and foster the autonomy of the students in a project-based learning experience.

1. ***Follow my direction***. In this situation there is no delegated freedom at all. This is done when the student is at the bottom of the Bloom's taxonomy pyramid where the student might be able to memorize and understand the concept but lacks analytical skills. This level should be used only at the beginning of a project and in lower level classes such as the Freshmen Seminar
    - ***Observe and report, I'll decide.*** This level of delegation is asking for understanding of the concepts and analysis. On the other hand the instructor retains responsibility for evaluation and decision making.
    - ***Observe and report, we'll decide together.*** Here the analysis and evaluation is encouraged and becomes a shared process. This is very helpful for the development of confidence of the student. This allows for continuous feedback and the possibility to point out mistakes, without letting the student failing catastrophically, which would be a problem if the project is on a tight schedule.
    - ***Observe, report, and tell me what help you need to analyze the situation. Then we'll decide.*** This level differs from the first inasmuch the analysis process is now completely in the hand of the student which is free to ask for feedback. The evaluation is still a shared process.
    - ***Provide me your analysis and action plan. I'll let you know IF you can act.*** At this level of delegation, the analysis and evaluation is in the hand of the student. A level of trust has been built but the instructor still retains a veto power on the final decision.
    - ***Let me know plan of action, then go ahead unless I say not to.*** This is the final stage where the instructor becomes hands-off. This sentence could be reversed for students who want to expand their autonomy by proactively providing analysis and action plan and asking for execution unless the instructor says otherwise.

The above level of delegations can be mapped to the educational learning objectives quantifiable using Bloom's taxonomy. Furthermore, they can be mapped to Perry's level of intellectual maturity [10, 11].

Table 1: Intellectual Maturity according to Perry's Levels

Stage of Intellectual Maturity (Approximate Perry Levels)	Perceptions of Knowledge	Abilities to Make Commitments	How Solutions to Problems are Perceived	Perceptions of the Responsibility of Learners	Perceptions of the Responsibility of Experts as Teachers
Dualism-Individuals at this level are concrete thinkers who believe things are right/wrong, we/they, good/bad.	Knowledge is a set of truths.	I have faith in, and a commitment to, truth and knowledge as it is stated by genuine authorities.	There is a single correct solution to every problem.	I receive explanations of knowledge and become uneasy when asked to think independently, draw conclusions, or give my points of view.	Experts are authorities with an ability to explain and give me correct answers.
Multiplicity- At this level they recognize that diversity in thinking exists. Uncertainty prevails because all opinions are valid.	Knowledge is a matter of educated opinion.	I feel no need to commit to any specific belief or mode of thinking.	There is no one right solution to a problem, because all are equally valid.	I listen to experts, but have a right to my own opinions.	Experts explain course material to me and express their opinions.
Relativism- When they reach this level they perceive that all knowledge is relative, and that they need to orient themselves based on evidence.	Knowledge is not universal, but a matter of context and situation. What is true in one situation may be false in another.	I feel there is a need for some form of personal commitment.	Ambiguity is part of life, so I must defend my own position on problem solutions based on evidence.	I make comparisons to distinguish between weak and strong evidence in determining knowledge.	Based on their experience, experts teach procedures and analytic methods to help me reason and compare alternatives.
Commitment-Finally, at this level they develop the need to take positions and commit to them.	Knowledge is constructed from experience, what is learned from others, and from reflective thinking.	I feel the need to make commitments, especially a personal commitment to learning.	There are many solutions to each problem; some are better, and some are worse. I must take a stand on issues based on my personal values and analysis.	I learn and I integrate new knowledge with what I already know.	Experts are mentors that challenge my assumptions to support my learning.

We want to guide the students while they advanced in their level of intellectual maturity going from dualism where the "truth" is held down, to the Commitment level where the mentor is challenging the student assumptions and the student has made a personal commitment to learning. We can see that the delegation level 1 and 2 are appropriate for the "Dualist" level of Perry's Levels. Delegation's levels 3 and 4 are appropriate for "Multiplicity" and "Relativism" level of intellectual maturity. Instructor and students make decision together, where the students see the instructor as an expert that either provide an opinion or educate on the critical thinking process. Finally, Delegation's level 5 and 6 are appropriate for the "Commitment" level of intellectual maturity.

Conclusions

This paper has presented a possible path for PEs to use project-based learning as a path for students' self-learning. Projects are an ideal mean to use mentorship for the acceleration and the development of students' learning autonomy. We would like to conclude by quoting the philosopher Lau Tsu, which stated in the Tao Te Ching: "The ancient master did not try to educate the people, but kindly taught them to not know. When they think they know the answer, people are difficult to guide. When they know that they do not know, people can find their own way [12]". We believe this perfectly exemplify the role of a PE which is to make the students develop their own thirst for knowledge rather than providing information.

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Lessons Learned from Updating the Affective Domain of Learning Skills

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The aim for the *Classification of Learning Skills* over the past 25 years has been to support the quality of processes and outcomes by assisting learners and educators with non-overlapping skill descriptions both within and across domains. The cognitive and Social domains have had stronger clarity and completeness than the Affective domain. Therefore, the update of the affective skills has required substantial reorganization at all levels to better define these skills to allow ease of selection for the real-life contexts for which they are needed. The five processes now include: (1) Engaging Emotionally; (2) Expanding Self-Efficacy; (3) Clarifying, Building, and Refining Values; (4) Personal Development; and (5) Expanding Beyond Self. Using this framework resulted in cluster labels that better define the concepts that tie together the groups of learning skills within each process. The presentation of ten major insights learned from constructing the new Affective Domain will provide both background and material for further discussion. The revised classification of the affective skills will expand the awareness of learners and educators about the psychological importance of these skills for success in building and using skills from the other domains. The revision also will provide an improved foundation for integration of affective learning skills into all aspects of Process Education practice.

Notes

Improving Student Success through Retrieval Practice

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Abstract

First-semester General Chemistry students are often first-semester college students who have not developed independent learning skills. These students struggle to adapt to the rigors of post-secondary education, which frequently leads to them dropping out of college. Extant research has shown the benefits of retrieval practice, the practice of self-testing, for long-term retention and consolidation of learning material. In this paper, an approach for teaching chemistry students about retrieval practice is presented. In this approach, students experience retrieval practice while learning essential chemistry knowledge. Then they are guided to adopt the strategy as independent learners in the chemistry course. Preliminary data suggests that this approach can positively impact college chemistry success. Future development of the approach will also be discussed.

Introduction

College student success is an important issue for both students and universities. Many students come to college lacking learning skills that will help them be successful, and unfortunately, many of them end up dropping out of college as a result. Retrieval practice, the practice of self-testing, has been shown to have a strong positive effect on learning and long-term retention (Karpicke & Roediger 2008). In this paper, an approach for helping students experience the benefits of retrieval practice is presented. The hope is that by experiencing retrieval practice and its benefits, that students will be more likely to adopt the strategy during the time they spend learning outside the classroom.

Method

The following approach is modeled after the method of Karpicke & Roediger (2008), and it is modified to fit into a 50-minute class session. Data was collected on a total of 102 college students in four separate sections of a first-semester Chemistry (General Chemistry I) course. One professor collected data in three of the sections and another professor collected data in the fourth section. Very early in the semester, a 50-minute class period or one hour at the beginning of lab was devoted to the following retrieval practice experience.

Students were given a list of 11 polyatomic ions and 4 unit analysis tools to study for 5 minutes (Figure 1). Students then took a test (Figure 2) on the 15 items for 5 minutes. The order of the 15 items on the test was scrambled compared to the order on the study sheet. The students exchanged papers with a partner and graded each other. As the students were grading, the professor pointed out examples of correct and incorrect answers to try to ensure accuracy of peer grading. For example, "SO_4" is incorrect for sulfate because it lacks the charge of the ion.

After the grading period, students received their test back. On their study sheet, students were asked to cross off the items they got right, and they were asked to take 4 minutes to study only the items they got wrong on the first test. Students then did another round of testing/grading on all 15 items in accordance with the experimental condition of Karpicke & Roediger (2008) that yielded the best results for long-term retention (i.e., the condition were all items were repeatedly tested). The order of the 15 items on the second test was once again scrambled.

Students were given another study sheet and asked to cross off the items they got right on the Round 2 test. The students then studied only items they got wrong for the Round 3 test. Grading of the Round 3 test was done outside of class by the professor.

One week later, the students were given an unexpected final exam as a measure of long-term retention. The students presumably hadn't studied the items since the week before, and this experience was done early enough in the semester that none of the items were covered in class during the previous week. The professor graded the final exam and double-checked the grading of the Round 1 test.

Results and Discussion

Retrieval Practice Experience and Long-Term Retention

Table 1 shows typical scores from implementing the retrieval practice experience in a first-semester General Chemistry section. On average, student scores increased from the Round 1 Test (49.5 ± 28.6) to the Round 3 Test (77.8 ± 25.9) on the first day. One week later, the average on the Final Test was 47.0 ± 31.6. As a measure of the amount of material retained after one week, the Final Test score was divided by the Round 3 Test score. The average % retention value was 61.4% even after the students had not studied or had not been tested on the material for one week. The % retention values reported here do not quite reach the value of 80% reported by Karpicke & Roediger 2008, but this could be due to different experimental conditions due to class-time restrictions and/or differences in the learning material. However, the % retention values reported here still suggest a significant amount of long-term retention caused by retrieval practice (aka the testing effect).

This retrieval practice experience was repeated in three other General Chemistry I sections. The experience in one of these additional sections was administered by a different professor in an effort to get a preliminary measure of the generalizability of the approach. Figure 3 shows the average % retention values from all four sections. The average % retention values ranged from a low of 45.8% in an 8AM lab to a high of 67.6% in a 10AM lecture. As a frame of reference, in the Karpicke & Roediger 2008 study, the experimental condition that involved repeated studying of all items but not repeated testing of all items yielded an average % retention value of 36%. Therefore, further confirmation of the benefits of retrieval practice vs. studying for long-term retention was observed here.

Retrieval Practice Experience Metacognition Follow-Up

After the retrieval practice experience on the first day, the students were provided a document, which discussed the things that were done that day for them that they would have to do for themselves if they wanted to adopt the learning strategy of retrieval practice (Figure 4). The document also mentioned the benefits of retrieval practice in an effort to promote buy-in to adopt this learning strategy. To motivate the students to learn the benefits and tasks of retrieval practice, the students were told that they would be quizzed on this material in the next class period. All this was done in an effort to help the students understand how to put this strategy into practice on their own.

Future Work

Future work might involve surveying the general sleep habits (duration and time of going to bed and waking up) and amount of sleep the previous night before doing the retrieval practice session. Sleep has been shown to play a critical role in promoting declarative memory (Lahl et. al, 2008). Future work might also involve having the students document implementation of retrieval practice through the use of an ePortfolio (Morreale et. al, 2017). This documentation in an ePortfolio could serve as bonus points on the first exam.

Concluding Remarks

In this paper, we report the implementation of an in-class retrieval practice experience for first-semester General Chemistry students. The results suggest that a significant amount of long-term retention occurred for the material in the experience. This intervention was designed to help students experience retrieval practice and to convince them of the benefits of retrieval practice so that they might adopt it as a strategy during their time spent learning material outside of class. Furthermore, knowledge of polyatomic ions and unit analysis tools is very important to success in many General Chemistry topics, so this experience doubled as a learning experience that helped the students in topics they learned later on in the semester. All of this was done in an effort to increase student success in General Chemistry I, and preliminary data suggests that it has. For example, 75% of the students who experienced this early-semester intervention passed General Chemistry I course which traditionally has a pass rate of 65%. Further development of this intervention can hopefully lead to even higher percentages of student success.

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Table 1. Retrieval practice data from one General Chemistry section

Student #	Round 1 Test Score	Round 3 Test Score	Final Test Score (one week later)	% Retained[a]
1	80	93.3	100	107.2
2	53.3	60	40	66.7
3	20	60	40	66.7
4	100	93.3	93.3	100.0
5	86.7	93.3	93.3	100.0
6	26.7	73.3	53.3	72.7
7	53.3	100	33.3	33.3
8	0	20	6.7	33.5
9	13.3	40	26.7	66.8
10	40	66.7	46.7	70.0
11	46.7	86.7	13.3	15.3
12	86.7	93.3	93.3	100.0
13	66.7	93.3	46.6	49.9
14	40	80	26.7	33.4
15	53.3	100	6.7	6.7
16	33.3	80	13.3	16.6
17	13.3	13.3	13.3	100.0
18	66.7	93.3	93.3	100.0
19	26.7	100	26.7	26.7
20	93.3	100	60	60.0
21	40	93.3	60	64.3

	Round 1 Test Avg. ± SD	Round 3 Test Avg. ± SD	Final Test Avg. ± SD	% Retained Avg. ± SD
	49.5 ± 28.6	77.8 ± 25.9	47.0 ± 31.6	61.4 ± 32.1

[a]% retained is calculated as Final Test Score/Round 3 Test Score *100

Figure 1. Sample of the study sheet containing 11 polyatomic ions and 4 unit analysis tools

Retrieval Practice Experience Study Sheet (Round 1 and Round 2)

Polyatomic ions (study the formula and charge of these ions)

ammonium ion = NH_4^{1+}

acetate ion = $C_2H_3O_2^{1-}$

carbonate ion = CO_3^{2-}

hydroxide ion = OH^{1-}

nitrite ion = NO_2^{1-}

nitrate ion = NO_3^{1-}

sulfite ion = SO_3^{2-}

sulfate ion = SO_4^{2-}

phosphate ion = PO_4^{3-}

chlorite ion = ClO_2^{1-}

chlorate ion = ClO_3^{1-}

Unit analysis tools (study these tools as well as any notes that accompany them)

Avogadro's number: 1 mole of any substance = 6.02×10^{23} particles of that substance

Molar mass: 1 mole of any substance = _____ g of that substance

Note: to get the number of grams, use the periodic table

Stoichiometry: _____ mole of one substance = _____ mole of another substance

Note: to get the number of moles for each compound, use a balanced chemical equation

Molarity: _____ mole of a substance in an solution = 1 Liter of solution

Note: the number of moles will be given or you will solve for it

Figure 2. Sample of the Round 1 Test

Retrieval Practice Experience Round 1 Test

hydroxide
molar mass
nitrite
sulfite
Avogadro's number
phosphate
acetate
carbonate
molarity
stoichiometry
nitrate
chlorate
chlorite
sulfate
ammonium

Figure 3. Long-term retention of material in the retrieval practice experience for four General Chemistry I sections

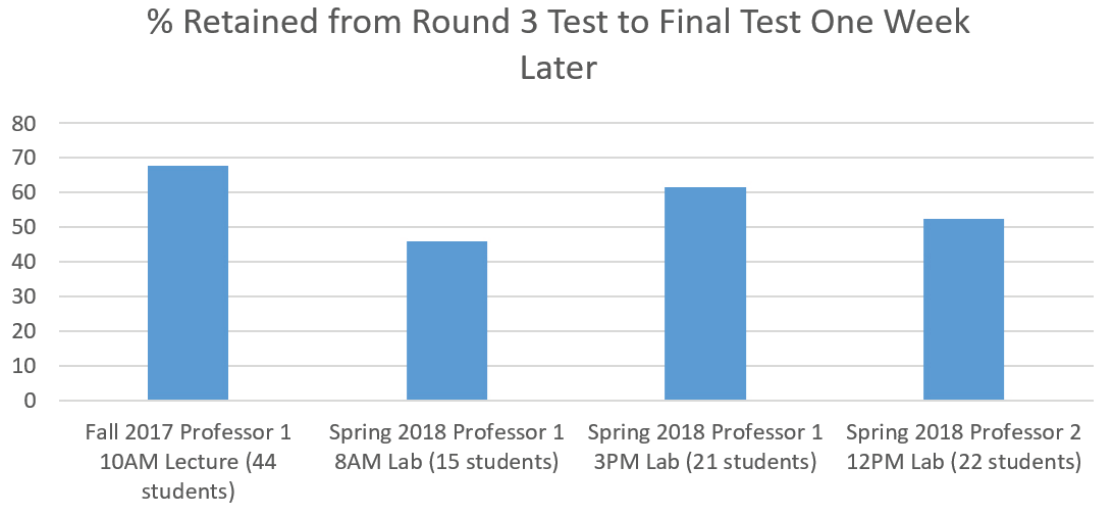

Figure 4. Retrieval practice metacognition follow-up document

Retrieval Practice Benefits & Tasks – study this material for a quiz in the next class period

What are four benefits of retrieval practice?

1. Many research papers show that retrieval practice promotes long-term retention of material that needs to be learned
2. Long-term retention of material means that you have taken control of the material, and you have made it your own. Don't let the material that you are learning in college take control of you, you take control of it.
3. Long-term retention of material can lead to increased enjoyment of learning because you can start to make connections between previous knowledge and new knowledge you encounter.
4. Retrieval practice can lead to reduced test anxiety because you have already tested yourself at home, and you can be confident that you know the material.

What seven things were done for you today that you would have to do for yourself in order to implement the learning strategy of retrieval practice?

1. Prepare an organized study sheet for yourself by re-writing the information from class onto one document
2. Have a timed study period (don't take too long with the study time, just jump in to the testing time after studying for a short amount of time)
3. Make your own test
4. Take your test with only a pen/pencil, the test paper, and a calculator (if applicable)
5. Grade your test, and be sure to grade it accurately
6. Repeat the study/test cycle by studying only things you got wrong, but testing over **all** material **every** time
    a. research shows that **long-term** learning occurs most during testing of yourself where you have to actively recall information from your brain; the research also shows that **long-term** learning does not occur very well if studying is not accompanied by testing
    b. research also shows that it is best to distribute the study/test cycles over several days because sleep helps consolidate the learning in your brain and make it more permanent
7. Use the power of "accountability to a group" by teaming up with a classmate so you can motivate each other to do the things listed above
    a. FYI: in class today, you tested yourself because you were being accountable to me and the rest of the class; "accountability to a group" is a very powerful motivating force for doing things we don't want to do

Notes

Faculty Performance: How to define and measure quality in Teaching and Learning

CBI 010
4:00pm

Facilitator: Mark Terrell, Lake Erie College of Osteopathic Medicine

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=127

OVERVIEW

An important aspect of education quality is teacher quality. On any campus, certain faculty members are identified culturally as "good" teachers. What does this really mean? How do you collect evidence that they are "good" or even "Great"? Student evaluations of teaching are widely used to measure teaching quality and are often used to compare teaching effectiveness across different courses, educators, departments and institutions; as such, they are of increasing importance for academic promotion decisions and for student course selection. However, the response rate on course evaluations is highly variable and inherent with selection biases that reduce the data's validity. Additionally, there is no agreement over a single, unified definition of quality teaching. Nonetheless, professors, school leaders, policymakers and researchers agree on the importance to learning of high-quality, effective teaching. Therefore, if we could measure the effectiveness of teaching accurately and then act to improve on it where needed, the impact on student learning would be significant. This workshop will help layout criteria and dimensions of what quality in teaching looks like and will also explore how to develop measures to represent ranges of abilities in each criteria.

LEARNING OUTCOMES

- Define quality in teaching
- Identify key characteristics of great teachers
- Explore how the characteristics of great teachers relate to student learning and performance.
- Develop measures to capture teaching activities as evidence of excellence for purposes of annual performance reviews and academic promotion

PLAN

- Work in pairs to discuss the characteristics of great teachers. (15 minutes)
- Panel discusses definitions of quality in teaching. (15 minutes)
- Panel presents tools for measuring quality in teaching. (15 minutes)
- Work in pairs to discuss experiences with annual performance evaluations and academic promotion in the area of teaching excellence. (15 minutes)
- Panel identifies strategies of how to document faculty work in teaching for purposes of annual performance evaluations and/or promotion. (15 minutes)
- Panel takes additional questions from audience. (10 minutes)
- Complete a workshop assessment form. (5 minutes)

Notes

CBI Lobby
5:30pm

Team Reflection

Facilitator: Will Ofstad

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=105

OVERVIEW

Each team member has had his or her own set of learning experiences during the day and needs time to reflect and produce meaning from the experiences. This time period provides both individuals and teams time to reflect and document their discoveries and insights resulting from today's conference activities.

PLAN

Readiness:

Reflect on each workshop and learning experience from the day and bring insights to the team discussion.

Application:

1) Reflection
    a. Each team member identifies the two most important things he or she learned about each learning goal from the morning's session
    b. Each team member shares this personal learning among the rest of the team so that it can be clearly communicated to other teams
    c. The entire team identifies the two most important things learned they have learned collectively about the team's three goals
    d. The recorder for each team posts personal and team discoveries for the day under the team's thread on the Moodle site so other teams as well as those outside the conference can benefit.
2) Ensure the team is oriented to readiness assignments for the next day.
3) Determine team roles for the next day.
4) Discuss with your team mentor (as needed) three mentorship outcomes:
    - Establish and maintain a Quality Learning Environment
    - Create an atmosphere of self and peer accountability for readiness
    - Shifting culture from processing information rather than transferring information
    - Produce and reflect on team contract, team goals, and team learning outcomes
    - Capture the knowledge and research efforts on the Moodle site
    - Coordinate a presentation of team learning and research over the entire conference in a concluding gallery walk

Notes

From Vines to Wines:
Field Trip to the Lake Erie Grape Belt

Join your colleagues for a special networking event immersed in an evening tour of sightseeing, experiential learning, and wine tasting in wine country! The Lake Erie Grape Belt is the oldest and largest Concord Grape growing region in the world. With over 30,000 acres planted in vines consisting of over 60 varietals sold to 30 wineries, enjoy the beautiful vistas of large vineyards adjacent to the shores of Lake Erie. Participants will visit a 200 acre vineyard/farm to learn the processes in growing vines and producing grapes, including equipment, geology, environmental conditions, and sustainable agriculture. Here, participants will have an opportunity to walk among the vineyard's vines, which will likely be in bloom. Then participants will visit a local winery to learn about turning grapes into wine and will experience wine tastings wines ranging from sweet to dry, including ice wine! Lastly, participants will taste wines from a second winery, where a light dinner will be provided. Transportation included.

So, what are you waiting for? Sign up for your guided vineyard and wine tour today!!!

Notes

FRIDAY
JUNE 15, 2018

Section 3

Session Legend

 Keynote/Plenary
 Symposium
 Workshop
 Distance Workshop
 Poster Session
 Teams/Groups
 Meeting
 Special Event
 Break
 Lunch/Meal

Time		Session Information	Where	Page
8:00 am		**Team Time** (Facilitator, Will Ofstad)	Lobby	3-3
8:30 am		**Symposium 2: Institutional Practices for Engaging i-Generation Students** (Facilitator, Mary Moore)	Lobby	3-5
10:15 am		**Break**	Lobby	
10:45 am	**Parallel Sessions**			
		**Using Self-Growth Papers as a Qualitative Research Tool to Study Transformational Learning** (Wade Ellis)	205 (BISL)	3-15
		**Specifications Grading** (Cynthia Woodbridge, Angi Lively)	300	3-17
		**Papers: Learning to Learn STEM** (Raj Chaudhury)	010	3-23
12:15 pm		**Lunch**	Lobby	
1:00 pm		**Keynote 2: Role of the Academy in the iGen Age** (Speaker, Matthew Watts)	Lobby	3-49
1:45 pm		**Break**	Lobby	
2:00 pm	**Parallel Sessions**			
		**iGens and the Rest of Us** (Mary Moore, Ken Colburn)	205 (BISL)	3-51
		**Deliberately Developmental Organizations** (Wendy Duncan)	300	3-53
		**Papers: Service Learning and Outreach** (Shawn Clerkin)	010	3-55

Time		Session Information	Where	Page
3:30 pm		**Break**	Lobby	
4:00 pm	**Parallel Sessions**			
		**Researching the Recovery Course** (Dan Apple)	205 (BISL)	3-69
		**Teaching Critical Thinking** (Joann Horton)	300	3-71
		**Papers: Learning Sciences** (Sean Quallen)	010	3-75
5:30 pm		**Team Meeting** (Facilitator, Will Ofstad)	Lobby	3-89
6:15 pm		Adjourn		
7:00 pm		Academy Social @ VooDoo Brewery & Restaurant		3-91

CBI Lobby
8:00am

Team Time and Readiness Assurance

Facilitator: Will Ofstad, California Health Sciences University

OVERVIEW	This activity is to help ensure all learners are prepared and can share what they learned with their peers. Where gaps exist, the team works to support and clarify.	
PLAN	Readiness:	Complete the preparation and readiness assignments for the Day 2 programming you plan to attend.
	Application:	Be prepared to share key findings of what you learned and/or take a readiness test.

Notes

CBI Lobby
8:30am

Symposium 2: Institutional Practices for Engaging i-Generation Students

Facilitator: Mary Moore, University of Indianapolis

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=135

ABSTRACT

Institutions have been creating new programs to attract and support the values and needs of i-Generation students. They also have been modifying existing programs to align with these values and identified needs. A panel of leaders in their institutional programs will discuss the importance of recognizing and fulfilling these needs. Panelists will identify the problem or opportunity associated with their program, primary objectives, summary of activities, selected results, and what the future holds for their program.

PANELISTS

Notes

GGC Institutional Practices to Engage iGen Students

Joseph Ametepe, Associate Dean, School of Science and Technology, Georgia Gwinnett College

Institutional & student population background

Georgia Gwinnett College (GGC), a member of the University System of Georgia (USG), is an access institution opened in 2006 as **the first four-year college founded in Georgia in more than 100 years**, and the first four-year, public college created in the U.S. in the 21st century. Currently, GGC enrolls over 12,000 students in just a little over 10 years and the US News and World Report has determined that GGC is the ***most ethnically diverse institution (public or private) in the South***. The diversity of the GGC student body (33% Black/ African American, 17% Hispanic, 35% White, 10% Asian) is mirrored by the diversity in its faculty. The characteristics of GGC students (among others) are:

(i) A high percentage of students are first generation students (approximately 50%) –need **regular guidance, and motivation**

(ii) Many students come to GGC with poor academic performance skills, time Management skills, professionalism, and career counseling – need **personalized mentoring and time management support**

(iii) Many students struggle with paying for college - **approximately 65% receive Pell**

(iv) Greater percent of student work a significant number of hours *(largest average work hours in the USG system)*

Addressing Challenges

GGC has embraced an access mission and built its institutional practices around high engagement strategies such as employing technology use with **high-tech classrooms, small class sizes, faculty-student mentoring models, peer supplemental instruction (PSI) programs, implementation of recovery programs for failing students, and free-student tutoring services among others**.

How practices are implemented

- *Faculty i-phones & student engagement:* GGC offers i-Phones to all its faculty members to promote regular communication between faculty and students. Faculty are thus readily available to students via cell phone for advising and academic questions assistance outside the office. The i-Phones are considered to be an extension of the classroom for student engagement.
- *Small class sizes:* GGC uses small class sizes in all courses (24 in lab courses, 28 in non-lab courses). The science labs are built to hold a maximum of 24 students at 6 work stations. Thus, as opposed to an approach that uses large auditorium style-classes, small classes produce an engaging environment where faculty are well aware of their students' progress and able to identify students that are struggling.
- *Mandatory use of D2L:* GGC faculty are required to use "Desire To Learn" or D2L as the platform for course delivery. This requirement allows GGC students to access course related materials on their cell phones regardless of time of day or their location. GGC provides yearly professional training to faculty members in using the learning platform.
- *High impact mentoring model:* GGC employs a mentoring program where all students are assigned a faculty mentor. Faculty meets with their assigned students each semester for academic mentoring, graduation program review, and others. The faculty mentors work closely with students throughout their years at GGC. Student mentoring is part of faculty annual evaluation.
- *Academic Enhancement Center:* GGC provides free tutoring through the Academic Enhancement Center (AEC). The AEC offers free one-on-one tutoring for students needing supplemental instruction outside the classroom. Faculty members from all disciplines volunteer hours at the

AEC as part of their student engagement service - **student engagement is one of the four evaluation areas expected of GGC faculty.**

- *Peer supplemental instruction:* GGC employs a special brand of peer supplemental instruction (PSI) in STEM to support student learning and success. The GGC PSI brand is different from other PSI models in that **the instructors are students rather than the professors.** The PSI instructors are selected based on performance in the introductory science classes with high recommendation from faculty. Drawing on past experiences as model students, the peer instructors use a variety of active learning techniques such as concept mapping, drawing for optimal understanding, and metacognition. A team of expect professors from each of the participating STEM subjects provide peer instructors "best tutoring practices" training and professional training.
- *Recovery program for failing students:* Established a model recovery program called the Grizzly Renewal Opportunity Workshop (GROW) specifically designed with focused expectations designed to help students progress. The program allows students who have been academically suspended after fall semester to attend spring semester enrolled in fewer courses. **For every 50 GROW students, 10 successfully exited the program and roughly another 15 have been eligible to continue.**
- *Internal grants to support faculty-student work:* Encourages faculty members to develop active engagement classroom related projects to support students learning. As such, there are several institutional grants *(e.g. NSF to support of faculty to develop course-embedded projects to increase undergraduate research experience for students, SST mini-grants program, USG STEM initiative grants, STEC mini-grants, STEC4500 consumable funds, SEED grant and others)* to support faculty efforts. **In SST, over 90 faculty conduct research with students.**

1st and 2nd year RPG rates

These practices among others have helped mitigate some of the retention, progression, and graduation rates at GGC. Currently, GGC's first year retention is 67-70% and second year retention is 65%. These results indicate that more concentrated efforts is required to help more students remain and graduate at the institution.

Student responses

GGC student survey on "Institutional practices satisfaction" indicated that majority of students were satisfied with institutional practices of engagement in the areas of: Faculty-student engagement outside of the classroom via the use of smart phones, Level of student mentoring and personalized mentoring model, Peer-supplemental instructional opportunities, Flexible AEC hours, and availability of the Faculty-student research opportunities.

iGen Academic Recovery Fosters Dialogue for Additional iGen Programming

Janet Vigna, Professor of Biology, Academic Success Camp Coordinator,
Grand Valley State University, Allendale, MI

Grand Valley State University (GVSU) is a public four-year institution engaging roughly 12,000 full-time undergraduates in a comprehensive liberal arts education. The campus has a rich history of excellent teaching, active scholarship and public service. With an average class size of 26, Grand Valley works to maintain a small college learning experience within a large university environment. GVSU has always had a wide variety of support systems and programs in place to promote the success of its students, particularly during the first-year experience. However, in recent years, it has been made clear that additional efforts are needed to specifically understand the needs of the current iGen student population and to support and retain these unique students with innovative programming at multiple levels.

One very important initiative that was started in 2015 is the GVSU Academic Success Camp, a week-long residential experience that works with students who are in academic jeopardy following their freshman year. The camp experience takes place each spring in the week following final exams and works to build academic performance and self-efficacy through process learning methodology. Students engaging in the camp are given an overwhelming curriculum to complete in a short period of time, and the expectations are high for the quality of their work. In order to be successful in this intense environment, they learn to build relationships with their peer teams and faculty mentors who provide feedback assessment and promote positive motivation throughout the week. In addition to academic skills, students learn to use reflection and process logic for decision-making and develop skills for resiliency when facing failure. By the end of the week, students have grown deep, supportive roots in the GVSU community, and they use their new tools, along with professional advising and counseling, to create a very specific plan for future academic and personal success. When they return to campus the following fall semester, they receive follow-up support from their faculty mentors, and student success staff, to renew the important connections they made the previous year.

While the Academic Success Camp has been a very powerful experience for this group of students, and very successful in the retention of many of them to graduation, its larger impact has been felt in a variety of dialogues it has inspired across campus with faculty, staff and administrators, all interested in the success and retention of this unique iGen student population. Outcomes of the camp have been particularly helpful in understanding the parameters for success through the lens of the struggling student. The experiences of students in the camp have made clear the need for strong faculty-student relationships, meaningful peer connections, frequent and personal advising, and an integrated wellness culture. While the iGen population is among the most digitally connected we've worked to educate, their success depends heavily on becoming personally connected, feeling a sense of belonging and having confidence in their ability to succeed in a university environment. In the face of anxiety and fear of failure, they need immediate support from trusted peers, faculty and support staff, and the capacity for self-growth.

As the wave of student success and retention initiatives for this generation has gained momentum at GVSU, we have seen a more university-wide awareness and collaboration between the multiple activities happening across campus. The following list of activities provide a sample of current engagement between students, faculty, staff and administration toward this goal.

- Requests from faculty to volunteer for the Academic Success Camp have more than tripled since its first year. The imperative to retain every student is growing.
- Faculty who have participated in the Academic Success Camp have gone on to engage in Faculty Teaching Circles exploring the literature related

to the iGen college experience. In collaboration with the Pew Faculty Teaching and Learning Center on campus, these faculty are creating products for best practices in teaching specific to this generation.

- Faculty from different disciplines are attending conferences together, related to the First Year Experience and issues surrounding Gateway Courses.
- STEM faculty have formed groups with Math and Writing faculty to discuss curriculum revisions for science Gateway courses that include the potential use of peer mentors, targeted active learning strategies and transparent assignment techniques.
- Faculty, staff and administrators meet to discuss student retention as a social justice issue, continuing to promote equity in the campus experience and course curriculum.
- Administrators, faculty and support staff have collaborated to develop a faculty mentor program for incoming freshmen, informed in part from Academic Success Camp outcomes.
- Student Success offices have been restructured to collaborate more closely with Academic Advising and to work with faculty in their classrooms.
- Student Affairs staff are meeting with faculty to create a more tangible sense of campus belonging, by merging social and academic college experiences.
- Community Engagement experiences are blossoming across campus, creating relevance and belonging in course curriculum, and authentic application of academic knowledge and skills.
- Everyone across campus is learning how to communicate, both digitally and personally, with the iGen population, employing new educational technology in the classroom and real-time communication tools for messaging and safety at all times.

Meaningful support for student success requires the commitment of dedicated faculty, staff and administration at multiple levels and across disciplines. It also depends on a clear understanding of current and future student populations, and the confluence of initiatives that target the many challenges students face today. Many activities, including the Academic Success Camp have contributed to the current momentum across the GVSU campus to generate that meaningful support for the continued success and retention of the current iGen population.

Mid Semester Teaching Feedback Provides Insight into iGEN Needs

S. Raj Chaudhury, Executive Director, Innovation in Learning Center
and USAonline, University of South Alabama, Mobile, AL 36688

Overview:

At the University of South Alabama, we have launched a formal process for gathering and reporting mid semester feedback from students with the goal of improving the learning experience. Instructional consultants visit classes upon instructor invitation, the instructor leaves the room and the consultant conducts 25-30 minute structured interviews with students in the courses. Aggregated student responses are provided to the faculty member in a debrief follow up meeting. This formative teaching assessment process gives iGEN students a voice while there is still time in the semester to make any adjustments that could improve their learning. Initial impressions from 3 semesters with over 100 classroom visits (including online courses) will be shared.

Instructional Feedback:

While end of semester evaluations done via student ratings instruments are quite common at all levels of higher education, what is less prevalent is a service that provides faculty with student feedback collected and moderated by an external consultant. Institutional teaching and learning centers can provide this service – a resource intensive endeavor that lasts for a relatively short period of time during the semester (typically weeks 5-9).

A mid semester teaching assessment is conducted with an eye towards using feedback for improvement. The program we have initiated at the University of South Alabama is detailed at this web site: http://southalabama.edu/departments/ilc/sgif.html. An email goes out to the campus faculty declaring that "SGIF Season" is here. We use the name Small Group Instructional Feedback (SGIF) for our process. SGID – Small Group Instructional Diagnosis or MSF – Mid Semester Feedback are also commonly used acronyms across the country.

There are several flavors of the process used to gather student feedback, but certain elements are constant across all of these methods: (i) the faculty member completes a form requesting that feedback be collected from their students – providing course name, section number, time and location of meeting etc. Online courses indicate their modality on the request form; (ii) the request is processed at the teaching center and an assigned consultant contacts the faculty member to determine the most appropriate method of data collection. For most classes the most common practice is a visit by the instructional consultant to talk to students while the faculty member leaves the room. For some classes, an online questionnaire is sent to students whose results come directly to the consultant. (iii) the student feedback is gathered by having them discuss in small groups their responses to the following questions which match the SII framework of Process Education – (a) What is going well in this class (thinking about the lectures, assignments, tests, availability of professor etc.)? (b) Do you have any specific suggestions that could improve your learning? (c) Other comments about the learning environment (that don't fit in the above two categories). Students first write responses as a group (for about 10 minutes) and then whole class sharing occurs (10-15 minutes) as each group reads out their responses and the consultant asks follow up clarification questions as needed. Students are made aware that the process is voluntary and confidential (their data are typed up to anonymize handwriting) and that the purpose of the activity is to gather feedback while there is still time in the semester to make any adjustments; (iv) the student data are compiled into a report and the consultant schedules a debriefing meeting with the faculty member.

Much of the published work on mid semester teaching feedback (Hurney et. al., 2014) has focused on traditional face to face classes. There has been some work relative to online instruction (Herman and Langridge, 2012). Our group at South Alabama has been adapting all aspects of the traditional classroom-based SGIF to fully online class environments.

That work is forthcoming (Williams, Thongsawat, Chaudhury and Guo, 2018). In addition, while the bulk of SGIFs are done with undergraduate courses, our experience with online is in the realm of graduate professional courses in allied health disciplines.

Themes of Student Feedback:

It will come as no surprise that iGen students, many of whom have grown up with the secondary school testing environment imposed by the No Child Left Behind Act, have a narrow view of what learning assessment means. This leads to some tension with faculty members who bemoan the students' desire to the spoon fed and the students' who have grown up in an environment where content coverage is only given importance as it relates to high stakes assessments. This theme occurs throughout the data we have collected at South – with over 100 SGIFs completed in three semesters since its inception.

Students have been pleasantly balanced in their reports on most classes – the iGen students are used to giving feedback with 'Likes' on social media and buy into the message of leading off a feedback session by acknowledging the strengths of a faculty member's teaching performance. Some groups write more than others on certain questions in the initial group work aspect of gathering feedback – however, a technique that allows us to provide more nuanced data is requesting students to add to their papers any comment from another group in class that resonates with them during the whole class sharing portion of the SGIF. Thus – iGen students show evidence of being listeners in the feedback process.

As consultants we make clear to the students that despite their feedback, certain aspects of the course may not change at all (due to accreditation reasons or other departmental requirements) but what we could encourage the faculty member to do is explain their rationale behind the structure of certain parts of the course. A typical response we get from faculty is "I told them that at the beginning of the semester" which highlights how some lessons need to be revisited and repeated because students simply forget.

Improving the quality of instruction is an ongoing process at all institutions and our approach resonates with the ideas of Process Education. If your campus does not have a teaching and learning center, near-peer faculty consultants can be trained to conduct these mid semester assessments. The rich, qualitative data produced by SGIFs can bolster a faculty member's teaching portfolio as a complement to numerical student ratings data. It also gives students a real voice in improving our teaching effectiveness.

Providing Authentic Learning Experiences for iGen Students

Heather Conley, Director of Grants Development, Kirkwood Community College

Kirkwood Community College is an open access, two-year institution in Cedar Rapids, Iowa. Since 1966, Kirkwood has been a comprehensive community college, providing both career and technical programs as well as general studies programs for students planning to transfer. Annual unduplicated headcount for Kirkwood is currently around 21,000 students, with just over half our students planning to transfer to a four-year institution. Although the largest demographic group being served at Kirkwood falls into the traditional college age student, it is important to note that a growing segment of our student population is comprised of high school students taking advantage of college credit courses while still in high school.

Increasingly, demand for authentic learning experiences has grown. Among high school students, we have seen increased demand for job shadows and internships through our Workplace Learning Connection, to explore potential careers in our local area and assist in career and education planning. College age students are similarly looking for opportunities to engage in more authentic learning experiences that emulate the workplace. Kirkwood has responded through a number of initiatives to provide more authentic learning.

Examples of Authentic Learning Experiences at Kirkwood Community College

a. **Simulation Centers:** examples of simulation centers include a health care simulator, computer help desk simulators, a wind turbine simulation center, and a combine simulator. Recently, students arrived on campus and to a mock murder scene with students leading the crime scene investigation, and local law enforcement providing evaluation. Automotive tech works on newer model cars including a campus fleet. Vet Tech locates hard-to-adopt animals from the state, and has our Vet Tech students provide grooming, medical, and behavioral training before putting the dogs back up for adoption.

b. **Competency Based Learning**: KCC has invested in professional development opportunities for faculty to redesign curriculum for competency-based programs and provides instructional designers well versed to assist in this transition. CBE is expected to continue growing in the near future.

c. **Project Based Learning:** Increasingly, faculty members are incorporating project-based learning, with students assisting with real world projects developing marketing plans for local businesses and organizations, participating in hack-a-thons, creating and maintaining a habitat for trumpeter swans,

d. **Student Learning in Businesses Enterprises:** KCC has been active in developing new enterprises that operate like businesses on campus, using a combination of paid and unpaid student labor. Examples include a 77-bed hotel and restaurant on campus to support hospitality and culinary programs and a farming operation with both crops and livestock.

Supporting Authentic Learning at Kirkwood

Kirkwood works with a number of community business partners to ensure that we are meeting local needs. They need to ensure a strong pipeline of future workers with the skills and knowledge they seek to meet the demand in many growing industries. Workplace Learning Connection is an intermediary that connects businesses to schools and helps introduce students to potential careers that may not otherwise be apparent by organizing career fairs, internships, and job shadows. Aside from generous donations to help support program, we also invite local businesses and industries to participate in industry sector board and advisory boards. Industry sector boards focus on trends in their industry, current high demand occupations, and anticipated future needs. Advisory boards provide curricular support that helps identify the critical skills students need to compete on the job

market, and they also help evaluate our students once they are in the workplace so we can prioritize skills in the classroom that are difficult in the workplace.

Kirkwood's Center for Excellence in Learning and Teaching provides organized professional learning through topical sessions, learning institutes, and involvement of instructional designers who support instructors at Kirkwood and are well-versed in pedagogy and learning technology. The college provides additional financial support for attendance at conferences and workshops and sponsors a two-day Collaborative Learning Days event for faculty. An Endowed Chair fund provides additional support for faculty to pursue individual projects that impact their professional development.

Career Development Services has seen a marked expansion of their services. Whereas a traditional model suggests that students engage toward the end of college, students are seeking these services at an earlier stage in hopes of making connections, getting internships, and finding work that aligns with their programs. Students who are not sure about their career or educational pathway have the option of taking a Career Decision Making class, as well as meeting with a career development specialist to consider various assessments and investigate with the support of someone else. In addition, faculty are inviting the specialists to their classes to talk to students about career options.

The Future of Authentic Learning at Kirkwood

We anticipate that students will seek authentic learning experiences in the future. We have a working group providing support for apprenticeships in various fields and are looking to expand that model using stackable credentials that lead to various degrees, diplomas and certifications. This is a partnership with our corporate training program, which works directly with employers to design learning solutions.

Career Development Services anticipates increased demand from instructors who want to incorporate more work-based learning into their classrooms. We have proposed faculty externships, so faculty can actually experience the workplace and design appropriate learning opportunities for students and ensure that classroom learning objectives are aligned with high-demand careers and skills.

One of the other areas that Kirkwood has explored is placing students with businesses and industries to work on projects, with a faculty member serving as a mentor. These projects have several of the characteristics of internships and project-based learning, with students contributing to a real world project at business and also participating in a learning experience to support the project goals. A local co-working space accepted a staff member and students to provide services to local start-ups for a semester long experience. It is anticipated that demand for these types of learning experiences will continue to grow.

Using Self-Growth Papers as a Qualitative Research Tool to Study Transformational Learning

205 (BISL)
10:45am

Facilitator: Wade Ellis, Jr., West Valley College (retired)

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=139

OVERVIEW

Self-growth papers have been used for the last 15 years to investigate outcomes produced from Learning to Learn Camps. This workshop will explore the methodology that has been developed for using self-growth papers to research transformational learning. Participants will review specifications for a self-growth paper, analyze examples of student work as well as research annotations, and assess research efforts surrounding the WGU Recovery course. The ultimate goal of the workshop is to strengthen this research methodology and develop shared plans to use the methodology in different contexts to advance the scholarship of Process Education. learning process are on transformation of the learner.

LEARNING OUTCOMES

- Expand awareness how self-growth papers can be used to measure personal growth in specific learning skills.
- Collaborate on defining a research methodology for analyzing self-growth papers that can be used to study Learning Camps and Recovery courses.

RESOURCES

- Original self-growth papers (focused on different sets of learning skills) along with accompanying research annotations about each paper
- Specifications for writing a self-growth paper
- Profile of a Quality Collegiate Learner

KEY LITERATURE UPON WHICH THE WORKSHOP IS BUILT

IJPE article on History of Learning to Learn

IJPE article on Student Success Characteristics

IJPE article on cultural change process surrounding Recovery Course design

Draft of WGU Recovery Course Paper

IJPE article on Learning to Learn – Improving Learner performance

PLAN

- Review design of Psychology of Learning course as well as the role/specifications for the concluding self-growth paper (10 min)
- Work in pairs reading/reviewing a specific example of a self-growth paper that investigates a particular area of growth of interest to the pair, responding to critical thinking questions about what was read (20 min)
  - What is the self-growth paper measuring?
  - What evidence is provided within the self-growth paper?
  - What impressed you about the self-growth paper?
  - What concerned you about the self-growth paper?

PLAN (con't)

- Publicly report/discuss findings (20 min)
- Assess results from the WGU research effort w/concluding self-growth papers (15 min)
- Publicly report/discuss findings (20 min)
- Conduct workshop assessment (5 min)

Notes

CBI 300
10:45am

Specifications Grading – The what, the why, the how

Facilitators: Cynthia M. Woodbridge
and Angi Lively, Georgia Gwinnett College

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=145

OVERVIEW	Traditional assessment methods are an imprecise representation of student achievement. One main criticism is that many students are able to pass by virtue of partial credit instead of mastery of material. Specifications grading, on the other hand, is an outcomes-based assessment in which students demonstrate competence/mastery of content areas in order to achieve a specific grade – the more areas a student masters, the higher their course grade. A team of ten STEM faculty representing Chemistry, Physics, and Math have formed a working group at Georgia Gwinnett College (GGC). This workshop will describe how these faculty at GGC have onboarded this system and some of the challenges and victories we have encountered so far.
LEARNING OUTCOMES	• Participants will clarify the type of objectives they want to consider for specifications grading in a chosen course. • Participants will write at least three objectives appropriate for specifications grading for the chosen course. • Participants will draft an assessment (quiz) which will assess content/skill assessment for one objective. • Participants will engage in discussion that forecasts reaction by GenZ students to specifications grading
KEY LITERATURE	"Specifications Grading" by Linda Nilsson
PLAN	• Introduce specifications grading and describe how this is implemented sample STEM classes (15 min) • Work in pairs (group by similar interest) to outline the structure of objectives in a chosen course (20 min) - Critical objectives vs. other objectives? - How many objectives? • Report and discuss publicly insights and best practices (15 min) - Tabulate insights about critical objectives / other objectives • Working in the same groups, write an assessment of one of your objectives (15 min) • Inventory student reactions (10 min) • Publicly report and discuss findings (10 min) • Conduct workshop assessment (5 min)

RESOURCES

- Course Overviews – objectives, grading details, and contact information provided by Team SGG.
- Example quizzes provided by Team SGG
- Workshop assessment form

Notes

Activity 1 – Objectives and Assessments

PHYS1112K Physics II (algebra-based) Objectives

EO1 Be able to apply principles learned in PHYS1112 to new ideas. This will be demonstrated in your presentation/paper from Chapters 27-30. See the document "Project" in D2L for more details.

GO14.1 To understand systems that oscillate with simple harmonic motion – mass on a spring.

GO14.2 To understand systems that oscillate with simple harmonic motion – pendulum.

GO15.1 To learn the basic properties of travelling waves and apply to mechanical waves.

GO15.2 To learn the basic properties of travelling waves and apply to sound waves.

GO16.1 To use the idea of superposition to understand the phenomenon of interference.

GO16.2 To use the idea of superposition to understand the phenomenon of standing waves.

GO17.1 To understand and apply the wave model of light

GO18.1 To understand and apply the ray model of light.

GO19.1 To understand how common optical instruments (camera, telescope, magnifier) work.

GO20.1 To develop a basic understanding of the electric phenomena in terms of charges, forces, and fields.

GO21.1 To calculate and use the electric potential.

GO21.2 To calculate and use the electric potential energy.

GO22.1 To learn how and why charges move through a conductor as a current.

GO23.1 To understand the fundamental physical properties that govern resistors and capacitors in a series.

GO23.2 To understand the fundamental physical properties that govern resistors and capacitors in parallel.

GO24.1 To learn about magnetic fields and how they exert forces on currents.

GO24.2 To learn about magnetic fields and how they exert forces on charges

GO25.1 To understand electromagnetic induction and electromagnetic waves.

GO26.1 To understand and apply basic principles of AC electricity

PHYS1112 – Quiz 16.2, Version A

All answers must have correct units and SF for full credit!

1. Complete this table

	Symbol	Units
Frequency		
Wavelength		
Wave speed		

2. Sketch a standing wave; label the nodes and antinodes.
3. Sketch the following:
   a. For a tube open on one end, the second harmonic
   b. For a tube closed on both ends, the first harmonic
4. A 1.30 m long gas column that is open at one end and closed at the other end has a fundamental resonant frequency of 80.0 Hz. Sketch the tube and standing wave.
5. What is the speed of sound in the gas in question 4?

PHYS1112 – Quiz 16.2, Version B

All answers must have correct units and SF for full credit!

1. Complete this table

	Symbol	Units
Frequency		
Wavelength		
Wave speed		

2. Sketch a standing wave; label all the nodes and antinodes.
3. Sketch the following:
   a. For a tube open on one end, the m = 2
   b. For a tube closed on both ends, the m = 3
4. A 1.30 m long gas column that is open at one end and closed at the other end has a fundamental resonant frequency of 80.0 Hz. Sketch the tube and standing wave for the m = 2 state.
5. What is the speed of sound in this gas?

PHYS1112 E01

NAME: _____

A flute is an open-open tube. You are familiar with the standing waves associated with open-open tubes.

1. Draw the fundamental standing wave for this open-open tube.
2. The lowest note (longest wavelength) that can be produced on a standard flute, which is 0.6 m long, has a frequency of 280 Hz. My flute can produce a frequency of 250 Hz. How long is my flute?
3. The lowest note my piccolo will produce is at 580 Hz. How long is my piccolo?

Activity 2 – Re-takes, tokens, and redemption

MATH1111 (College Algebra)

The MATH 1111 course outcome goals have been condensed into a series of Critical Skills (CSs) for this course. These are Essential Learning Outcomes that will be used throughout this course, and as you progress into Precalculus and Calculus. In addition to the CSs, there are a series of General Skills (CSs) – as the number of these General Skills mastered increases, so does the course grade potential.

More Details

- There are 8 CSs and 18 GSs for this course.
- Your letter grade is associated with mastering all of the CSs and a specified number of the GSs by the end of the semester. A "pass" is defined as a score of 80%+ on the SpecCheck associated with a specific Objective. Quiz items are graded as Pass/Fail – no partial credit, as this ensures that the score reflects true mastery of the objective.

1st attempt of SpecChecks:

- During class, after content has been covered and practiced.
- To be adequately prepared for these, you will need to invest time outside of class in learning, studying, and practicing. The amount of time will vary from objective to objective and from student to student.

Possible additional retakes of SpecChecks:

- During "Exam" Hours (there are 4)
  - o May retake up to 3 SpecChecks during each Exam Hour
- You may gain additional retake(s) by redeeming Token(s)

Token Policy

- Each student begins with 3 "free" tokens. This is my gift of peace of mind to you.
- Tokens are earned by the corresponding objective Quiz within the MyMathLab learning platform. You must complete this at an 85% minimum grade.
- Tokens for linked objectives (CS2* and CS6*) will be provided by instructor
- Maximum of two (2) Tokens can be redeemed at one time
- Token Redemption:
  - o **Never** during your regularly scheduled class times, unless otherwise noted
  - o By appointment through online scheduler
  - o You must notify Professor Lively of your intent to redeem tokens with a minimum of 48 hours notice.

Unused tokens have no value and cannot be traded/sold/bartered to other students

Worksheet (please add space for notes between questions)

1. Which course is your team considering?

2. Whether they are content-based or skills-based, write at least 3 objectives associated with the course you identified. (Course summaries, including objectives, are in the online resources).

3. (Activity 1) Based on your objectives, write a few assessment questions and, time permitting, some grading/assessment criteria for these questions. (Sample quizzes are provided in the online resources).

4. (Activity 2) What will be your policy for re-takes? (More details on tokens and order forms are provided in the online materials).
   a. How many retakes are students allowed?

   b. When will students be allowed to re-take quizzes?

   c. How will students earn retake attempts?

5. Additional Notes

Learning to Learn in STEM

CBI 010
10:45am

Facilitator: Raj Chaudhury, University of South Alabama

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=142

ABSTRACT

This session investigates special features of learning to learn in different STEM disciplines.

PANELISTS

Paper (Presenter/Author)..... **Page**

Note that abstracts of papers in this session are included if full papers were not available as of May 1. Also note that papers for this session are abbreviated if longer than 12 pages in length. Full papers for this session may be found online in the resources available for this session.

Notes

Generalizing - Interfacing Effectively between Learning and Problem Solving

Presented by Tris Utschig, Kennesaw State University

A missing ingredient in effective learning and problem solving performances is the ability to generalize knowledge effectively so that it can be fluidly transferred to new learning or applied seamlessly to a problem solving situation. This paper will illustrate the role generalizing plays within the learning process, the problem solving process and especially as the interface between the two processes. The current effort presented will be based upon 25 years of research on the learning process, problem solving process, Classification of Learning Skills and Levels of Learning. The paper will enhance understanding of the generalizing process, which learning skills support the process, how generalizing enhances both the learning process and problem solving process by increasing the quality in the level of learning. Finally, the paper provides an activity faculty can use to improve student performance in generalizing.

Notes

Employing a Rubric to Assess Learner Performance in Calculus and Differential Equations

Presented by David Kaplan, York College with editorial consultant Virgil Ganescu

Abstract

Among the key measurement tools in the 2017 paper by Wade Ellis and Dan Apple, Learning to Learn Mathematics - Why is it Critical?, is table 7, which measures collegiate learners' mathematics performance across 28 characteristics. Lowest-level learners are said to perform as survival learners, while highest-level learners perform as pioneer learners. Between these extremes are, in order, need-based learners, contained learners, and professional learners. A classroom rubric measuring 14 of the 28 learner characteristics was created from table 7. At the beginning of calculus II and differential equations classes, the rubric is discussed with the students, making clear the intent to measure increases in learning levels occurring across these 14 characteristics, from the beginning to the end of the course, in a flipped-classroom environment. Students self-evaluate their learning level on these characteristics at the beginning and end of the course. The paper analyzes and discusses the increases in students' learning levels and how the instructor facilitated them. Future studies are envisioned using this rubric to achieve targeted learning levels suitable for courses at various levels, using flipped and other high-impact pedagogies, with traditional classrooms serving as controls.

In their 2017 paper, *Learning to Learn Mathematics – Why is it Critical*?, Wade Ellis and Dan Apple build on the limited existing scholarship** about learning mathematics to develop a comprehensive set of mathematical-learner characteristics, as well as a set of tools for measuring mathematical learner performance. Table 7, Measuring Mathematics Collegiate Learner's Performance, is a highly-applicable tool for assessing student learning-level improvements. Working with the paper authors, I honed the language and terminology used in table 7 so that it could be used by collegiate-level mathematical learners to self-assess their learning-level in the various categories.

A classroom experiment was designed using the Table 7 tool to measure collegiate mathematics learning improvements in two calculus II and one differential equations class, in the spring 2018 term. To make the tool easier to apply, a restriction to fourteen (14)* of the 28 characteristics was employed. A distributed Adobe PDF form was developed for students to assess their mathematical learner level at the beginning and the end of the course. The PDF tallies student scores based on whether they assessed themselves at learner level (in order): survival, need-based, contained, professional, or pioneer across each of the 14 characteristics. These were assigned point values of 2, 3, 5, 6, and 7 respectively. So, if a student initially assessed themselves as a need-based learner across all 14 characteristics, they would have an initial score of 42; and if they assessed themselves at the end of the course as a professional-level learner across all categories, they would have a final score of 84.

At the beginning of each course, a 45-minute explanation session was given on how to understand and use the PDF tool, which was displayed on the overhead as students in a computer lab looked at the copy that they had received prior to the start of class. A hypothetical student at each of the learner levels across the 14 characteristics was discussed: a survival learner, a need-based learner, etc. After a brief question and answer session with the students about the learning levels, the instructor was convinced that they understood how to use the rubric to self-assess.

* Skeptical, Precise, Productive Struggle, Self-reliant, Abstract, Visualize, Tool Usage, Interprets Data, Interprets Notation, Identifies Key issues, Reuse Solutions, Translator, Teacher, Quick-thinking

** A survey of the post-2013 literature (see abstract summaries in references) shows learning gains for the flipped-classroom, but none with mathematics-learner rubrics or courses. Further research is called for.

Students first submitted consent-to-participate waivers and were then asked to fill out and submit the distributed PDF with their initial learner-level assessment. Approximately 50 students submitted the initial form out of 77 students enrolled in three classes: 2 calculus II and one differential equations.

The flipped-classroom pedagogy was employed each day in all three classes—under the assumption that learning performance would improve most when students were "put in performance" during each class. Prior to class, students watched a video on the day's material, which discussed the theory and included solved example problems. At the beginning of class, the instructor spent 20-30 minutes going over the material that was in the video, focusing on the problem-solving approach.

The first day of class, the students were put into groups, each with four members. Each group was assigned at least one problem to present at the board each class. The groups worked among themselves to solve the given problem(s), sometimes consulting members of other groups. When a group had misunderstandings they could not overcome, or background deficiencies, they would call the instructor over for a consultation. Sometimes this required the instructor to ask just a convergent question or two; sometimes a hint using an analogous problem was sufficient to get the group on track. Other times it was necessary to sit down with the group in an intervention-like fashion for as much as 15 minutes, instructing through background deficiencies because the groups had widely varying background skills in algebra and calculus. Early in the course, most groups needed guidance, though in varying degrees, about how to initially approach, and set up, the solving of the problem.

About halfway through the class, the PDF rubric was put up on the overhead again and further discussed, with the instructor pointing out examples of learning-level improvements the class had been making, as evidenced through the daily problem-solving sessions and the presentations at the board. As the course progressed, the nature of the instructor consultations changed considerably. Whereas the consulting sessions were extensive at the beginning of the course, as the course moved closer to the end, most groups became significantly more self-reliant, with many groups just checking their process and final answer with the instructor. Not all groups got on board, though, about 20% of each class did not make significant improvements in their learner level, based on instructor assessment. And, even at the end of the course, most groups needed guidance when the techniques were especially complex.

As the course progressed, the quality of the student presentations noticeably improved. For the first few weeks, the instructor would take the time to carefully point out, after the presentations, what would have made them professional-level presentations: proper use of terminology, more thorough and in-depth explanations of each step, or explaining why a technique was used and how to use that technique properly. The instructor would each time stress that these evaluations were done not to judge the presenters, who were thanked for their hard work in publicly presenting, but to inform everyone in the class about the components of a high-quality presentation. By the end of the course, some presenters were as polished as the instructor. Almost all presenters made significant improvements, even the weakest students made some improvements.

In the last week of the course, students' final learner-level assessments were turned in. While 50 students had submitted the initial survey, only 36 students submitted usable final surveys. Students had some issues recording their responses using the Adobe PDF form, an issue that a revised Google survey form fixes.

What do the initial vs. final data say; were there learning-level improvements? The answer is a decided "yes". The average initial student assessment was a 58, meaning that the average student entered the class assessing themselves about halfway between a "need-based" and a "contained" learner. At the end of the class, the average student assessed themselves as a 77, which is about halfway between a "contained" and a "professional" learner, an 18-point improvement, more than one category level. Furthermore, the nine strongest students in the class, assessed themselves at the professional level or higher.

Looking at the individual categories: visualize, interpret data, interpret notation, reuse solutions, and quick-thinking had the largest increases, about one-and-a-half category levels increases, from below the "contained" level to halfway or higher between the "contained" and the "professional" level. The "Precise" category had the smallest increase, at slightly less than one category level, 0.8. The remaining categories, skeptical, productive struggle, self-reliant, abstract, identify key issues, and teacher, all had more than a one category-level improvement, from a learner-level lower than "contained" to a learner level less than halfway between "contained" and "professional".

As a cross-check on validity, the instructor made changes to any of the initial and final student self-assessment scores that did not align with their assessment of a student's level. (See columns G, I, and L.) Six (14%) of the initial scores were lowered, but the overall average score only decreased 4 points, remaining about halfway between the "need-based" and "contained" categories. Twelve (33%) of the final point assignments were changed, but the overall average score of 75 remained higher than "contained" and approaching the "professional level".

The instructor-assigned final minus initial "delta" was checked vs. the students' delta. It increased slightly versus the student delta, from 1.3 category levels to 1.5 categories levels (from 18 to 20 points overall), further confirming the learning-level gains made. Finally, it is noted that the correlation between course grade % and either the students' or instructor's final score, or the student or instructor delta, was weak (0.07 to 0.14 – see Excel rows 83-93, columns S-Z). This correlation analysis summarizes the fact that a significant number of students achieved large learning-level improvements, but not the highest course percent grades, having started the course with lower mathematical skill levels or lower learning levels.

The instructor who conducted this study is experienced using the flipped-classroom approach and has a multi-year history of positive student observations using this approach. Even with the higher student-expectation levels required to achieve learning-level improvements as measured by this rubric, the student observations in these three classes were as positive as those the instructor received in previous terms. This leads to the conclusion that the use of this rubric, when introduced and explained properly, can be interwoven with other classroom expectations and lead to positive student learning results, ameliorating concerns some might have that it asks too much of students in lower-level mathematics classes.

Table 7 contains excellent ways to measure a student's mathematical-learning level. The distributed PDF employed for this study, or variants that may be better suited to mathematics classes at other levels, is a practical application of the table 7 framework. For students in lower-level mathematics classes for technical majors, the author suggests that a good objective is having the average student be beyond the

"contained" level and approaching the "professional" level, such as occurred in this study. For upper-level mathematics students, the author suggests that a good objective would be for students to be at least at the professional level, with many approaching the pioneer level.

Future studies, using controls such as pedagogies that include traditional classrooms, will be employed to assess learning-level improvements versus type of course and type of pedagogy in a larger variety of courses, as called-for by: Love, Hodge, Grandgenett, and Swift; Missildine, Fountain, Summers, and Gosselin; and O'Flaherty and Phillips. Test courses will include general education mathematics courses, where an objective of having students attain beyond a "need-based" learning level will be studied.

References

1. Betty Love, Angie Hodge, Neal Grandgenett & Andrew W. Swift (2013), Student learning and perceptions in a flipped linear algebra course, International Journal of Mathematical Education in Science and Technology , Volume 45, 2014 - Issue 3 Pages 317-324 | https://doi.org/10.1080/0020739X.2013.822582

(Before a significant number of university faculty will be willing to undertake such a dramatic change in instructional practices, as that represented by flipped classroom strategies, it will be critical to continue to build a foundation of systematic research that investigates the nature, utility, and effectiveness of flipped classroom models. Hence, further research is needed in other disciplines, instructional contexts and by additional STEM educators, to more fully contribute to the instructional decision-making being undertaken on college campuses today related to the use of flipped classroom environments.)

2. Kathy Missildine, PhD, RN, CNE; Rebecca Fountain, PhD, RN; Lynn Summers, MSN, RN; Kevin Gosselin, PhD (2013), Flipping the Classroom to Improve Student Performance and Satisfaction, Journal of Nursing Education. 2013;52(10):597-599, https://doi.org/10.3928/01484834-20130919-03

(Students were less satisfied with the flipped classroom method than with either of the other methods ($p < 0.001$). Blending new teaching technologies with interactive classroom activities can result in improved learning but not necessarily improved student satisfaction.)

3. McLaughlin, Jacqueline E. PhD, MS; Roth, Mary T. PharmD, MHS; Glatt, Dylan M.; Gharkholonarehe, Nastaran PharmD; Davidson, Christopher A. ME; Griffin, LaToya M. PhD; Esserman, Denise A. PhD; Mumper, Russell J. PhD (2014), The Flipped Classroom: A Course Redesign to Foster Learning and Engagement in a Health Professions, School Academic Medicine: February 2014 - Volume 89 - Issue 2 - p 236–243, doi: 10.1097/ACM.0000000000000086

(As class attendance, students' learning, and the perceived value of this model all increased following participation in the flipped classroom, the authors conclude that this approach warrants careful consideration as educators aim to enhance learning, improve outcomes, and fully equip students to address 21st-century health care needs.)

4. Jamie L. Jensen, Tyler A. Kummer, and Patricia D. d. M. Godoy (2015, Mar 2), Improvements from a Flipped Classroom May Simply Be the Fruits of Active Learning, , CBE Life Sci Educ. 2015 Mar 2; 14(1): ar5. doi: 10.1187/cbe.14-08-012

(We conclude that the flipped classroom does not result in higher learning gains or better attitudes compared with the non-flipped classroom when both utilize an active-learning, constructivist approach and propose that learning gains in either condition are most likely a result of the active-learning style of instruction rather than the order in which the instructor participated in the learning process.)

5. Jacqueline O'Flaherty, Craig Phillips (2015, April), The use of flipped classrooms in higher education: A scoping review, The Internet and Higher Education Volume 25, April 2015, Pages 85-95

(The results indicate that there is much indirect evidence emerging of improved academic performance and student and staff satisfaction with the flipped approach but a paucity of conclusive evidence that it contributes to building lifelong learning and other 21st Century skills in under-graduate education and post-graduate education.)

6. Michael D. Ryan* and Scott A. Reid (2016), Impact of the Flipped Classroom on Student Performance and Retention: A Parallel Controlled Study in General Chemistry, J. Chem. Educ., 2016, 93 (1), pp 13–23, DOI: 10.1021/acs.jchemed.5b00717

(Following this trend was a significant (56%) decrease in DFW percentage (Ds, Fs, withdrawals) in the flipped courses as compared with the control. While both courses incorporated online homework/assessments, the correlation of this indicator with exam performance was stronger in the flipped section, particularly among the bottom demographic.)

Table 7. Measuring Mathematics Collegiate Learners' Performance

Math learner characteristic	**Trained: survival learners**	**Learned: need-based learners**	**Learners: contained learners**	**Enhanced Learners: professional**	**Self-growers: pioneer learners**
Mindset	**As taught**	**When prompted**	**When useful**	**Conscious integration**	**Intrinsic integration**
Skeptical	Often accepting	Accepts experts	Questions inexperienced	Until fully convinced	Questions even self
Precise	Lay-level accuracy	Somewhat accurate	Working-level accuracy	Polished accurate work	Removes ambiguities
Productive struggle	Easy solutions	Known approaches	When In expertise area	When gain is great	Process 1st, results 2nd
Self-reliant	Minimally	In simple practice	In areas of confidence	In areas of responsibility	When others have failed
Reasoning	**One-step arguments**	**Basic arguments**	**Complex arguments**	**Proves theorems**	**Creates mathematics**
Makes conjectures	When forced to	In areas of interest	In area of expertise	All daily life challenges	Ground-breaking areas
Counter examples	When pointed out	Detects weak premises	Most issues challenged	Rarely fail to find	Challenges conventions
Logical	Frequent logic errors	No basic logical errors	Errors in intricate cases	Very rarely makes errors	Sees errors others miss
Rules out paths	Sees when pointed out	Sees obvious dead ends	Sees common dead ends	Sees most dead ends	Sees unseen dead ends
Thinking	**Memorizes**	**Follows explanations**	**Analyzes**	**Elevates Understanding**	**Integrates expertise**
Abstract	Needs concrete cases	For basic abstractions	When needed to think	To enhance thinking	Develops abstractions
Visualize	When obvious	Sees object in context	Sees object & contexts	Sees changing context	Paints pictures for all
Representations	The one and only	Illustrated alternatives	When confused	To increase richness	Continually varies
Makes connections	Only if fully elucidated	Obvious ones	Many connections made	Develops concept maps	Multi-level and visionary
Modeling	**Concrete only**	**Uses other's models**	**Develops basic models**	**Advancing models**	**Develops new models**
Builds models	Only uses tangible	Uses diagrams & images	Builds math models	Applicable new models	Innovative new models
Tool usage	Tool use w/ guidance	Common-use tools	Recommended tools	Comprehensive tool set	Extends, develops tools
Innovates	If nothing else works	In areas of keen interest	In professional expertise	When productivity stalls	Continuously
Interprets data	When essential	In commonly seen cases	To answer inquiries	To give insights	To broaden perspective
Learning	**Regurgitate as given**	**Can explain basics**	**Can teach others**	**Can generalize**	**Expertise and extension**
Interprets notation	Only after explained	As used commonly	Across most math fields	In new situations	Creates new notation
Uses examples	Uses when explained	Readily available	Creates simple examples	Plays with & modifies	Develops to test bounds
Thinks analytically	Sees obvious, if shown	Some distinctions	Sees details	Can explain details	Sees how to extend
Transfers knowledge	To same case	To cases practiced	To analogous cases	To new applications	To widely-varied cases
Problem Solving	**Formulaic problems**	**Complex exercises**	**Uses PS methodology**	**Real world problems**	**W/in & interdisciplinary**
Identifies problems	If others point it out	In area of concern	In common situations	Reveals target	Gain consensus
Identifies key issues	The most obvious	Many key	Most key	Ranked list	Includes unforeseen
Reuse Solutions	Mostly one time use	Very frequent problems	Most common problems	For most sub-solutions	Generalizes solution
Notices Assumptions	Perhaps, if challenged	Critical ones	Most used	For perceived use	For future uses also
Communication	**Often vague**	**Basic math language**	**Translates for audience**	**Explain math reasoning**	**Educates audience**
Vocabulary builder	Only if needed	Functional usage	Versed	To share ideas	To develop ideas
Translator	Struggles to be clear	Not always understood	Makes basics clear	Clarifies all details	Clarifies big picture
Teacher	Re-explains basics	Teaches as taught	Develops understanding	Develops math learners	Develops self-growers
Quick-thinking	Struggles with basics	In scripted situations	In expertise areas only	In professional discourse	In any situation

	Name	Major	Course #	Name	Initial	I:Inst	Final	F:Inst	F-I	Grade	I:F-I	Av
	a123	Math	MAT172.801	Calc II	82	82	93	93	11	4	11	103.0
j	a124	Non	MAT172.104	Calc II	42	42	76	76	34	4	34	2.0
j	b123		MAT172.104	Calc II	54	54	75	75	21	4	21	2.0
a	b124	CE	MAT172.801	Calc II	51	51	81	81	30	4	30	97.0
t	b125	Chem	MAT272.802	Differential	38	38	69	69	31	3.5	31	87.0
a	b126	ME	MAT272.802	Differential	58	58	78	78	20	3	20	82.0
d	b127	Bus	MAT172.104	Calc II	39	39	74	74	35	4	35	100.0
k	c123	CS	MAT172.104	Calc II	50	50	74	74	24	4	24	93.5
j	c124	CS	MAT272.802	Differential	70	36	76	54	6	3	18	82.0
j	c125	CE	MAT172.801	Calc II	46	46	60	75	14	4	29	97.0
a	d123	CE	MAT172.104	Calc II	46	46	50	60	4	3.5	14	90.5
e	d124	CS	MAT272.802	Differential	69	46	61	61	-8	3	15	80.0
c	e123	ME	MAT172.801	Calc II	89	56	95	75	6	4	19	91.8
d	f123	EM	MAT272.802	Differential	73	73	78	78	5	4	5	92.0
d	f124	ME	MAT172.801	Calc II	67	67	75	75	8	4	8	91.5
j	h123	Math	MAT272.802	Differential	76	56	75	68	-1	3	12	82.0
k	i123	ME	MAT172.801	Calc II	49	49	83	83	34	3.5	34	87.5
h	j123	CS	MAT272.802	Differential	59	59	98	68	39	3.5	9	88.0
r	j124	Chem	MAT272.802	Differential	55	55	85	75	30	3.5	20	87.0
g	l123	Math	MAT272.802	Calc II	67	67	80	80	13	4	13	93.0
j	l124	CE	MAT172.104	Calc II	62	62	81	85	19	4	23	101.5
s	m123	FC	MAT272.802	Differential	31	31	78	78	47	3.5	47	89.0
h	m124	UND	MAT172.801	Calc II	78	56	81	75	3	4	19	92.0
m	m125	ME	MAT172.104	Calc II	55	55	66	70	11	4	15	95.5
c	o123	ME	MAT172.801	Calc II	61	61	77	77	16	4	16	92.0
j	p123	2-math	MAT272.802	Differential	40	40	86	86	46	4	46	99.0
e	s123	CE	MAT172.104	Calc II	69	69	71	71	2	4	2	94.0
k	s124	CE	MAT172.104	Calc II	36	36	54	65	18	4	29	94.0
g	s125	CE	MAT272.802	Calc II	71	71	83	83	12	4	12	97.0
k	t123	2-math	MAT272.802	Differential	75	70	80	80	5	4	10	101.0
e	w123	Chem	MAT272.802	Differential	69	69	79	79	10	4	10	96.0
c	w124	Chem	MAT272.802	Differential	58	58	84	84	26	4	26	97.0
l	w125	Chem	MAT272.802	Differential	62	62	72	72	10	4	10	97.0
c	w126	2-math	MAT172.801	Calc II	32	32	54	54	22	3.5	22	89.5
t	w127	FC	MAT172.104	Calc II	64	64	86	86	22	4	22	97.0
rw	128	FC	MAT172.801	Calc II	54	54	91	78	37	4	24	92.0
average					58	54	77	75	18		20	
	av / category				4.2	3.9	5.5	5.3	1.3		1.5	
	Changed					14%		33%				

Calculus II	57	75	18
Differential	60	79	19

Survey

Survival	2
Need-based	3
Contained	5
Professional	6
Pioneer	7

Total score

Survival	28	2
Need-based	42	3
Contained	70	5
Professional	84	6
Pioneer	98	7

Change

neg to 4
5 to 10
11 to 20
20 to 30
30 to 40
greater 40

The average initial sccore is 58.
This is half "need-based", half "contained".

The average final score is 77.
This is half "contained", half "professional".

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Av*	*Var*
Column 1	36	2097	58	213
Column 2	36	2759	77	121

ANOVA

Var source	*SS*	*df*	*MS*	*F*	*P*	*Fc*
B/w groups	6087	1	6087	36	0	4
W/I groups	11693	70	167			
Total	17780	71				

	Name	Major	Course #	Name	Initial	I:Inst	Final	Av	F:Inst	Av	F-I	Grade	I:F-I	
j	a123	Math	MAT172.801	Calc II	82	82	93	103.0	93	103.0	11	4	11	
j	a124	Non	MAT172.104	Calc II	42	42	76	2.0	76	2.0	34	4	34	2.0
a	b123		MAT172.104	Calc II	54	54	75	2.0	75	2.0	21	4	21	2.0
t	b124	CE	MAT172.801	Calc II	51	51	81	97.0	81	97.0	30	4	30	97.0
a	b125	Chem	MAT272.802	Differential	38	38	69	87.0	69	87.0	31	3.5	31	87.0
d	b126	ME	MAT272.802	Differential	58	58	78	82.0	78	82.0	20	3	20	82.0
k	b127	Bus	MAT172.104	Calc II	39	39	74	100.0	74	100.0	35	4	35	100.0
j	c123	CS	MAT172.104	Calc II	50	50	74	93.5	74	93.5	24	4	24	93.5
j	c124	CS	MAT272.802	Differential	70	36	76	82.0	54	82.0	6	3	18	82.0
a	c125	CE	MAT172.801	Calc II	46	46	60	97.0	75	97.0	14	4	29	97.0
e	d123	CE	MAT172.104	Calc II	46	46	50	90.5	60	90.5	4	3.5	14	90.5
c	d124	CS	MAT272.802	Differential	69	46	61	80.0	61	80.0	-8	3	15	80.0
d	e123	ME	MAT172.801	Calc II	89	56	95	91.8	75	91.8	6	4	19	91.8
d	f123	EM	MAT272.802	Differential	73	73	78	92.0	78	92.0	5	4	5	92.0
j	f124	ME	MAT172.801	Calc II	67	67	75	91.5	75	91.5	8	4	8	91.5
k	h123	Math	MAT272.802	Differential	76	56	75	82.0	68	82.0	-1	3	12	82.0
h	i123	ME	MAT172.801	Calc II	49	49	83	87.5	83	87.5	34	3.5	34	87.5
r	j123	CS	MAT272.802	Differential	59	59	98	88.0	68	88.0	39	3.5	9	88.0
g	j123	Chem	MAT272.802	Differential	55	55	85	87.0	75	87.0	30	3.5	20	87.0
j	l123	Math	MAT272.802	Calc II	67	67	80	93.0	80	93.0	13	4	13	93.0
s	l124	CE	MAT172.104	Calc II	62	62	81	101.5	85	101.5	19	4	23	101.5
h	m123	FC	MAT272.802	Differential	31	31	78	89.0	78	89.0	47	3.5	47	89.0
m	m124	UND	MAT172.801	Calc II	78	56	81	92.0	75	92.0	3	4	19	92.0
c	m125	ME	MAT172.104	Calc II	55	55	66	95.5	70	95.5	11	4	15	95.5
j	o123	ME	MAT172.801	Calc II	61	61	77	92.0	77	92.0	16	4	16	92.0
e	p123	2-math	MAT272.802	Differential	40	40	86	99.0	86	99.0	46	4	46	99.0
k	s123	CE	MAT172.104	Calc II	69	69	71	94.0	71	94.0	2	4	2	94.0
g	s124	CE	MAT172.104	Calc II	36	36	54	94.0	65	94.0	18	4	29	94.0
k	s125	CE	MAT272.802	Calc II	71	71	83	97.0	83	97.0	12	4	12	97.0
e	t123	2-math	MAT272.802	Differential	75	70	80	101.0	80	101.0	5	4	10	101.0
c	w123	Chem	MAT272.802	Differential	69	69	79	96.0	79	96.0	10	4	10	96.0
l	w124	Chem	MAT272.802	Differential	58	58	84	97.0	84	97.0	26	4	26	97.0
c	w125	Chem	MAT272.802	Differential	62	62	72	97.0	72	97.0	10	4	10	97.0
w126		2-math	MAT172.801	Calc II	32	32	54	89.5	54	89.5	22	3.5	22	89.5
m	w127	FC	MAT172.104	Calc II	64	64	86	97.0	86	97.0	22	4	22	97.0
w12891		FC	MAT172.801	Calc II	54	54	91	92.0	78	92.0	37	4	24	92.0
	average				58	54	77		75		18		20	
	av / category				4.2	3.9	5.5		5.3		1.3		1.5	
	Changed					14%			33%					

Column 1		*Column 2*
Column 1	1	
Column 2	0.073	1

Student delta vs % grade

Column 1		*Column 2*
Column 1	1	
Column 2	-0.12	1

Instructor final vs % grade

Column 1		*Column 2*
Column 1	1	
Column 2	0.141	1

Instructor delta vs % grade

Column 1		*Column 2*
Column 1	1	
Column 2	-0.14	1

Skeptical		Precise		Prod Strug		Self-reliant		Abstract		Visualize		Tool Use		Int data		Int Not		Key Issues		Reuse		Translator		Teacher		Quick think		Total	
I	F	I	F	I	F	I	F	I	F	I	F	I	F	I	F	I	F	I	F	I	F	I	F	I	F	I	F		
7	7	6	6	7	7	6	7	5	6	6	7	6	6	5	7	6	6	5	7	5	6	6	7	6	7	6	7	168	82
3	6	5	5	3	5	3	5	2	6	3	6	3	6	3	6	3	5	3	5	3	6	3	5	2	5	3	5	118	42
3	5	5	5	3	6	5	5	3	6	3	5	3	5	5	5	3	6	3	5	5	6	5	5	3	6	5	5	129	0
3	6	3	6	5	6	3	6	5	6	3	6	3	7	2	7	3	6	5	6	5	6	3	6	5	6	2	7	137	0
3	6	3	5	2	5	3	6	2	5	2	3	3	3	3	6	3	5	3	5	3	6	2	3	3	6	3	5	107	38
5	7	5	6	3	5	5	5	3	6	5	6	5	5	3	5	3	5	5	5	3	6	5	6	3	5	5	6	136	58
3	6	3	6	3	3	3	5	2	5	3	6	2	5	3	6	2	5	2	6	3	6	5	5	2	5	3	5	113	39
3	5	3	5	3	6	3	5	5	5	5	6	5	5	3	5	3	5	3	5	3	6	5	5	3	6	3	5	124	50
5	5	5	5	6	5	5	5	5	6	6	5	5	5	5	6	5	5	5	6	5	6	5	6	3	6	6	5	147	71
5	5	3	3	3	5	3	5	5	5	3	5	3	3	3	5	3	3	3	3	3	3	3	5	3	5	3	5	106	46
3	3	3	3	3	3	5	5	3	3	3	3	2	3	5	5	3	3	3	3	2	3	3	5	3	3	5	5	96	46
5	3	5	5	5	5	6	5	5	3	5	6	5	3	5	5	5	5	5	5	6	3	5	5	5	3	2	5	130	69
6	7	6	6	7	7	6	7	6	7	6	6	7	7	7	7	6	7	6	6	6	7	7	7	6	7	7	7	184	184
5	7	6	6	6	6	6	6	6	6	5	5	5	5	5	6	5	5	3	5	3	5	7	6	6	5	5	5	151	73
6	6	5	6	5	5	5	5	5	6	3	6	5	6	5	5	5	5	3	5	5	6	5	6	5	6	5	6	146	67
5		5		5		5		5		5		5		5		5		5		5		5		5		5		70	70
5	3	5	5	6	6	6	5	7	6	7	6	2	5	5	7	6	6	6	5	5	5	5	6	5	5	6	5	151	76
5	7	3	6	5	6	3	7	2	5	3	7	3	6	5	5	2	6	2	5	3	6	5	5	5	5	3	7	132	0
5	7	5	7	3	7	5	7	5	7	3	7	3	7	3	7	5	7	3	7	3	7	5	7	6	7	5	7	157	59
5	6	5	5	3	6	5	6	3	7	3	7	5	6	5	6	3	5	3	5	3	7	2	7	5	6	5	6	140	55
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2	6	3	6	2	6	3	5	5	6	5	6	2	5	3	5	2	6	3	5	2	5	3	5	2	6	2	6	117	39
5	6	5	5	6	6	6	7	6	6	5	5	6	6	6	6	6	6	5	5	7	7	5	6	5	5	5	5	159	159
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3	3	5	5	3	5	3	6	5	5	3	5	3	7	6	7	5	6	5	5	5	5	5	6	5	5	5	7	138	61
3	6	3	6	2	6	3	5	2	5	3	6	3	6	5	7	3	7	3	6	3	7	2	6	3	7	2	6	126	126
6	6	5	5	6	3	5	5	6	6	3	5	6	6	3	5	5	6	6	5	5	6	3	5	5	3	5	5	140	69
3	3	3	3	3	5	2	5	3	3	3	3	2	3	3	5	2	5	2	3	3	3	2	5	2	5	3	3	90	36
5	5	5	6	5	5	6	6	5	6	5	6	5	6	5	6	5	6	5	6	5	6	5	6	5	6	5	7	154	154
	7		5		6		5		5		6		5		6		5		5		5		6		6		5	77	0
6	6	7	6	6	5	6	6	6	6		6	5	6	6	5	6	5	5	5	5	6	5	6	6	6	6	6	155	155
5	6	5	5	5	6	6	6	6	6	5	6	5	7	5	6	5	5	5	5	3	5	6	6	3	5	5	5	148	69
3	6	4	5	3	5	6	7	3	6	5	5	3	6	6	6	5	6	3	5	3	6	5	7	5	7	3	7	141	57
3	5	5	5	5	5	5	5	5	5	3	6	5	6	5	5	5	5	3	5	5	5	5	5	5	5	3	5	134	0
3	2	2	2	2	3	3	5	2	2	2	6	2	3	3	5	2	5	2	3	2	5	2	5	3	3	2	5	86	32
5	6	5	6	3	5	5	6	5	6	3	5	3	6	5	7	5	7	5	6	5	6	5	7	5	7	5	6	150	64
5	7	3	6	5	6	5	6	3	7	3	7	6	6	3	6	3	7	5	6	5	7	3	7	2	6	3	7	145	54
4.3	5.5	4.4	5.2	4.1	5.3	4.5	5.6	4.3	5.4	4.0	5.6	4.0	5.4	4.4	##	4.1	5.5	3.9	5.2	4.1	5.6	4.3	5.7	4.2	5.5	4.1	5.6	av / cat	
	1.3		0.8		1.2		1.1		1.1		1.6		1.4		##		1.4		1.2		1.5		1.4		1.2		1.5	av incr	

		Unusable data			I	F
n	c123	CE	MAT172.104	Calc II		
d	d123	Ch	MAT272.802	Differential	67	
a	k123	CS	MAT172.801	Calc II		85
g	l123	CE	MAT172.104	Calc II	51	
h	m123	CE	MAT172.104	Calc II	41	
s	m124	FC	MAT172.104	Calc II		65
b	m125	ME	MAT272.802	Differential	58	
c	v123	2-M	MAT272.802	Differential	44	
p	w123	FC	MAT272.802	Differential	78	
s	z123	FC	MAT272.802	Differential	57	
	average				**57**	**75**

Notes

Learning to Learn Engineering - A Learning Sciences Approach to Engineering Curriculum Design and Implementation

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NOTE: This is a draft version of a paper under development for submission to the 2018 Frontiers in Education Conference

Abstract

Engineering education research has focused on subject matter and effective pedagogy. Lacking is research illuminating the learning process itself and development of learning skills in engineering students. This paper presents a framework for engineering learner development that leverages processes allowing learners to learn more effectively, i.e., learning to learn engineering. Components include: engineering knowledge forms and levels; relationships between engineering knowledge and performance; risk factors; learner characteristics that produce working expertise; cultural shifts supporting learner development, and a model for the engineering learning process. Two case studies show how these components guide curricular implementation of learning to learn engineering.

Introduction

Research in engineering education has tended to focus on subject matter and effective methods in the classroom. Less developed is research relating to the learning process itself and development of learning skills in engineering students. This paper aims at expanding current engineering teaching and learning practices to include scholarship on learning to learn (Apple, Ellis & Hintze, 2016, How Learning Works, How People Learn) as it applies to engineering. This can be accomplished by leveraging the developed body of knowledge on learning processes to allow learners of engineering to learn more effectively, i.e., learning to learn engineering. This developmental approach is necessary to realize the vision of the Engineer of 2020, enhance engineering program's abilities to effectively address ABET assessment criteria, achieve general education outcomes, and increase retention and graduation rates.

The conceptual framework presented in Fig. 1 illustrates how *learning to learn engineering* can be implemented. Students learning engineering enter with certain *risk factors*. These risk factors can be reduced or eliminated by building the *characteristics of a quality engineering learner*. Development of these characteristics is best supported through a *culture of learning and growth* in programs and classrooms. This cultural shift can be accomplished by applying the *engineering learning process methodology* to curriculum design. And, finally, students will demonstrate improved *engineering knowledge* and improved *engineering performance* as a result of the learning to learn approach.

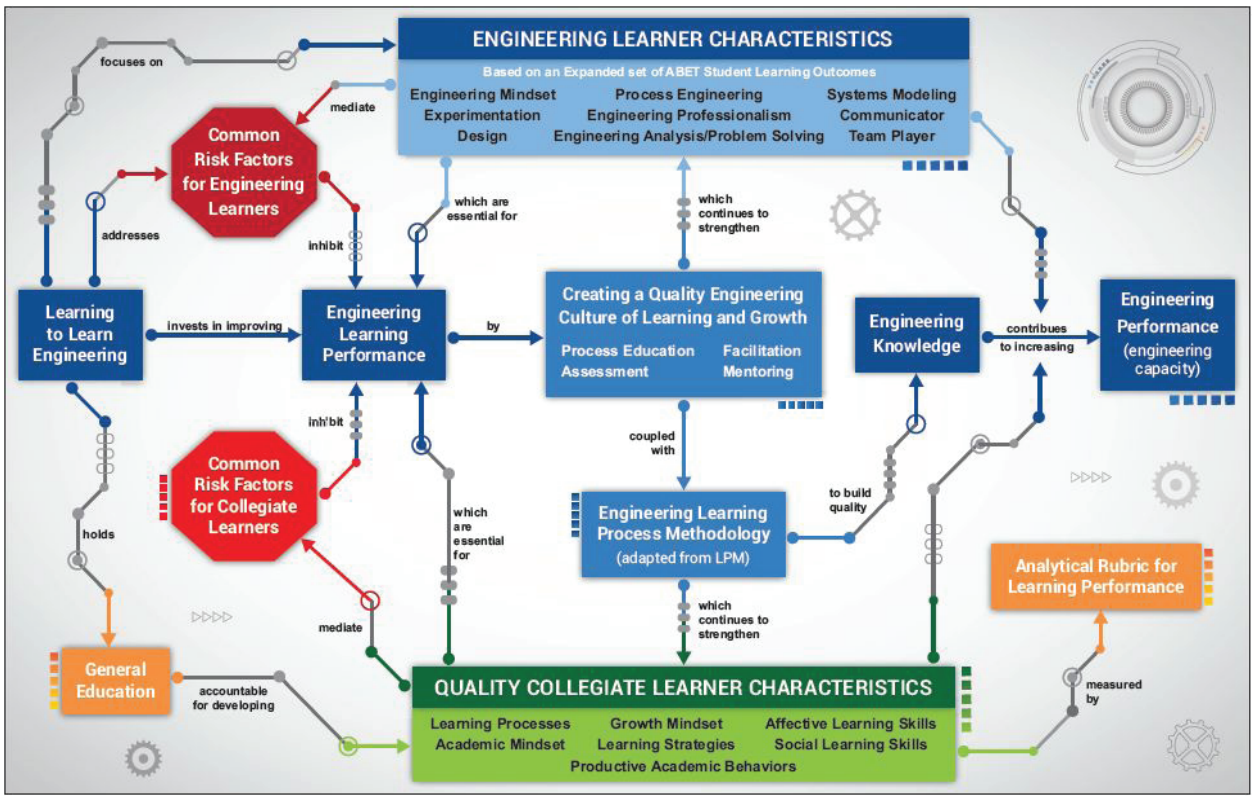

Fig. 1: Learning to Learn Engineering Conceptual Framework. Note: definitions of key terms may be found here (online glossary). These terms are shown in italics throughout the paper body.

Premises

Fig. 1 is built upon a set of three key premises for *engineering knowledge* and *engineering performance,* located on the right side of the figure. The premises state that for high quality *engineering performance*, students need to be able to generalize their *engineering knowledge* across a variety of forms, and do so at a high level. Keeping these premises in mind throughout the curriculum design and delivery processes enhances implementation of learning to learn engineering.

Forms of Knowledge

Five forms of knowledge important to engineering practice are: concepts, processes, tools, contexts, and "ways-of-being" (Quarless, 2007). The alignment of the *engineering learning process methodology* (described later in the paper) to each knowledge form makes knowledge development more accessible for all levels of learners. Table 1 provides examples of forms of knowledge in engineering.

Table 1. Example Forms of Engineering Knowledge

Concepts	*Processes*	*Tools*	*Contexts*	*Ways of Being*
Equilibrium	Units Analysis	Machine Shop	Laboratory work	Validation
Conservation of Energy	Design	CAD	Engineering analysis	Prototyping
Ohm's Law	Scientific Methodology	Software Suite	Manufacturing	Taking things apart

Levels of Engineering Knowledge

Bloom's taxonomy (1956) for cognitive educational learning objectives aligns well with learner development necessary to attain working expertise in engineering graduates. Nygren (2007b) created an approach for learners to elevate knowledge from level 1 to 3 that fits engineering well. Generalized, transferable *engineering knowledge* (Nygren's level 4) is the ability, without external prompting, to transfer appropriate knowledge productively into *engineering practice*. Nygren (2007a) describes the steps learners can use to produce generalized transferable knowledge as working expertise.

Nygren illustrates stages in the development of generalized transferable knowledge with his table, Levels of Knowledge Across Knowledge Forms, where comprehension and understanding are crucial stages in the learning process and prerequisites for being able to contextualize, generalize, and transfer knowledge.

Relationship between Engineering Learning Performance and Engineering Knowledge

Engineering knowledge at any given time is the result of the accumulated impact of engaging in engineering learning practices over a sustained period. *Engineering learning performance* is the driver of this accumulation of knowledge. To grow total *engineering knowledge*, one must pay attention to ways in which learning performance can be enhanced. We propose learning to learn engineering as the optimal mechanism whereby this learning performance increase can be accomplished. Below is a model adapted from kinematics that illustrates this approach. Within a time frame $t_1 \rightarrow t_2$ the total *engineering knowledge* gained, K, is the definite integral of the knowledge accumulation function (learning rate) over time. Here L_0 is the initial learning rate entering the performance period with L^2 representing a Learning to Learn function (similar to an acceleration) over that time period (assuming a continuous function). Analogous to the calculation of displacement, we can express this measure of engineering learning as:

$$K = \int_{t_1}^{t_2} dK = L_0 \int_{t_1}^{t_2} dt + L^2 \int_{t_1}^{t_2} t\, dt$$

This perspective of improving performance aligns with the idea of Sharpening the Saw (***Covey***, 2004).

Effective Learning Process is Necessary (but Not Sufficient) for Effective Problem Solving and Design

A critical component of engineering problem solving and design is the use of generalized, transferable knowledge – the kind of knowledge produced by an effective learning process. Only recently have efforts been focused on the need for students to develop the ability to generalize knowledge (reference PE Conf 2017) so that it can be transferred as the bridge from application (level 3) to problem solving expertise (level 4). Because of these efforts, major advancements occurred in developing learner performance. However, additional mechanisms needed to supplement effective learning process include strengthening classroom *facilitation,* constructive intervention, the use of active learning, learning activity design based on the *Engineering Learning Process Methodology*, integration of the classification of learning skills (Apple, Ellis, Hintze, 2016), and the extensive use of formative *assessment*.

The Role of Methodologies in Engineering Learning and Problem Solving

A methodology is simply a set of procedures describing a process. Methodologies can be used to identify which learning skills are most critical to implement in a learning process, to provide a powerful framework for both *assessing* performance and designing performance *measures*, and to help show

differences or connections between different processes, especially processes dependent upon or closely related to each other (such as learning and problem solving). The use of methodologies in *assessing* a learner's *engineering performance* and providing feedback to develop their learning skills increases metacognition and contributes to the development of important *engineering learner characteristics*.

Engineering Risk Factors

A critical difficulty in building engineering performance is to effectively address the *risk factors* that engineering students enter college with. Horton identified 20 key *risk factors* common to many, if not most, incoming college students (2015). Twelve of these 20 *risk factors* most important for learning engineering are described in Table 2.

Table 2. Risk factors for learning engineering that are common to all disciplines

Lacks Self-Discipline: Easily distracted	**Does not Generalize**: Knowledge is situational
Afraid of Failure: Avoids challenges	**Negative Self Judgment**: Focuses on failures
Unmotivated: Disinterested in learning	**No Self–Efficacy**: Feels inadequate
Fixed Mindset: Believe can't increase capability	**Teacher Pleaser**: Goal is grade not performance
Memorizes: Prefers algorithmic knowledge	**Unchallenged (bored)**: Lives in the comfort zone
Little Metacognition: Doesn't understand learning	**Insecure Presenter**: Scared of public speaking

Several additional risk factors are specific to learning challenges in engineering. These risk factors have been identified by many efforts (for example Bundy & Tartt, 2009) and are presented in Table 3.

Table 3. Additional Risk Factors for Learning Engineering

Struggles with Mathematics:	Fails to comprehend the physical implications and functional behaviors that mathematical relationships imply.
Memorizes Instead of Thinking	Sees engineering as memorized rote procedures versus an adaptable process that, with practice, has universal application.
Fails to Generalize Knowledge	Needs to be taught how to transfer and generalize knowledge.
Trouble Reading Engineering	Needs to be taught how to read and understand technical written information to augment their learning efficiency in class.
Fails to Manage Frustration/Anxiety	Unable to convert failure or negative feedback to learning; lets emotion interfere with accepting new challenges.
Minimal Problem-Solving Experience	Limited exposure to multifaceted, multivariable, multistep engineering problems solving strategies.
Isolated Learning	Fails to recognize the utility of working with others while learning.
Fixed Mindset	Fails to recognize that academic performance can be improved.
Concrete Thinker	Misses important aspects of situations/environments by focusing on specifics and details.
Confused about Engineering Discipline	Fails to recognize educational and occupational differences between technicians and engineers.

Engineering Learning Characteristics that Increase Engineering Performance

The expectations for an engineering learner span eight categories of performance, each with multiple characteristics, as shown in Table 4 (adapted from Apple, Beyerlein, and Utschig, 2017). These align with the *Profile of an Engineering Graduate* (link to website), ABET criterion

3 (ABET Engineering Accreditation Commission, 2017), and the Engineer of 2020 (National Academy of Engineering, 2004). Together, they illustrate that learners of engineering can reach far along the path to the Profile of a Professional Engineer (Davis reference). Further, since engineering learning is a specific type of learning, it shares the same general learning process characteristics derived from learning theory as do all disciplines. Therefore, we can advance students' engineering learning by leveraging learning theory to address the special attributes associated with learning in engineering.

Table 4. Profile of a Quality Engineering Learner

Engineering Mindset: The way of being of an engineer that differentiates the engineering profession from all other disciplines (PQCL: Confident, Leverages Failures, Persists) Aspects: Safety protector, solution producer, optimizer, tool user, innovator.
Engineering Professionalism: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. (PQCL: committed to success, manage frustrations, plans, works hard) Aspects: Client Advocate, Quality Specialist, Ethical Reasoner, Documenter, Project Leader
Engineering Analysis/Problem Solving: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (PQCL: problem solving, use resources effectively, validate) Aspects: Data Analyst, Reverse Engineer, Analytical Thinker, Unit Analyst, Visualizer
Systems Modeling: An ability to synthesize a situation, environment or problem area by building a systems representation with effective mathematical modeling. Aspects: Mathematical Modeler, Systems Integrator, System Thinker, Simulator, Issue Clarifier, Dual Coder
Design: An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and global, cultural, social, environmental, economic, and other factors as appropriate to the discipline. Aspects: Decision Maker, Prototyper, Solution Reuser, Concept Developer, Specifier
Process Engineering: An ability to see details of how processes are used to produce products/results, correct errors, and eliminate waste in order to ensure consistent quality. Aspects: Algorithmic Thinker, Debugger, Operations Manager, Product Tester
Experimentation: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions. Aspects: Scientist, Researcher, Technician
Additional ABET Student Learning Outcomes from Profile of a Quality Collegiate Learner Aspects: Communicator (from PQCL), Engineering Learning Performer (lifelong learning), Team Player (from PQCL)

Measure of Engineering Learner Capacity

Process Education research in the theory of performance, performance criteria and performance measures (Apple, Ellis & Hintze, 2016) led to the idea that learner capacity can be defined and measured with an *analytical rubric for learning performance* in engineering. The measure builds on the *Profile of a Quality Collegiate Learner*, containing 50 aspects organized in 10 categories. The *Profile of a Quality Engineering Learner* (PQEL) builds on the PQCL by adding an additional 33 aspects across eight categories, summarized in Table 4. Examples of the measurement levels used for categories and aspects are shown in table 5. The standard for a quality engineering graduate is level 5 in all 83 aspects.

Table 5: Example Learning Performance Measures

Level of Entry	Engineering Learner Characteristic	*Level 1*	*Level 2*	*Level 3*	*Level 4*	*Level 5*
		Trained: survival learners	**Learned: need- based learners**	**Learners: contained learners**	**Enhanced Learners: professional**	**Self-growers: pioneer learners**
Category	**Engineering Analysis/ Problem Solving**	**Formulaic problems**	**Complex exercises**	**Uses problem solving methodology**	**Real world problems**	**Within & interdisciplinary**
Aspect	Identifies problems	If others point it out	In area of concern	In common situations	Reveals target	Gain consensus

Needed Change in Engineering Education Culture

At the center of the learning to learn framework in Fig. 1 is the nature of the classroom and program *culture* in which engineering education is delivered. It is the responsibility of faculty to initiate and sustain high quality *facilitation*, *mentoring*, and *assessment* processes that underlie this concept. Previous research has recommended *cultural* shifts towards professional engineering perspectives (for example National Academy, 2004; Duderstat, 2000). In particular, process education research identified 14 aspects of *cultural* transformation that can dramatically shape educational outcomes (Hinze, Apple, Beyerlein, & Holmes, 2011). Each aspect is defined, related mindsets are characterized, and high impact teaching/learning methods for moving towards emerging practices supporting learning to learn are outlined at www.transformation-of-education.com. Three aspects of *engineering education culture* that engineering faculty and students may find most challenging, but which can produce productive faculty and student attitudes about learning to learn engineering, are discussed next.

The most profound change surrounds ownership of learning (Barr and Tag, 1995). Students need to own the process for their own learning, rather than be directed step-by-step on what to do or what problem solutions they need to mimic. Robust student ownership is established by the way faculty deliver course materials, set expectations, and provide opportunities for students to demonstrate their *performance*. This involves a clear set of learning goals and instructions, accompanied by well-crafted performance criteria by which student performance can be monitored and assessed. As part of this process, students should be expected to demonstrate critical thinking in questions they ask, in how they contextualize new knowledge, and in generalizing their knowledge across new and complex learning situations.

Ownership of learning is strongly influenced by the faculty mindset behind course delivery. Delivery begins with selection of course readings, exercises, laboratories, etc. It continues with formal and informal learning activities developed using the principles of process education (Faculty Guidebook module on Methodology for Creating a Quality Learning Environment). A

key expectation is that students prepare before they come to class, guided through thoughtful instructional design that stimulates review of prior knowledge as well as construction of new foundational knowledge. Student preparation should be measured and preparatory performance should be regularly assessed. Individual and team-based readiness assessment tests are an effective way to ensure learning preparedness (Ofstad et al). Pre-class preparation frees the instructor and the student to engage in higher level construction of understanding and application of knowledge during class time (Faculty Guidebook module on Constructive Intervention). Instructional delivery that is student-centered and features active learning promotes a pattern of interaction that underscores mastery in learning and problem solving as well as just-in-time assessment and reflective practice.

During instructional delivery, control should be shared between faculty and students, with students actively engaged in determining how time is allocated for growing knowledge and skills as well as assessing outcomes. While the instructor will need to allocate some time for presentation of essential material, students need freedom to provide input how time is apportioned between individual thinking for understanding, collaborating on exercises, presenting solutions to each other, and contemplating better ways to approach learning as well as problem solving. A strong teaching practice for promoting student voice and control is a mid-term assessment following the first major exam or homework assignment (FGB module on Mid-Term Assessment by Cordon). This helps to affirm course strengths, inventory potential course improvements, and crystalize other insights about learning to learn engineering.

Self-directed learning and growth does not emerge in a vacuum. It is cultivated by valuing student ownership of learning, facilitating enriching and engaging course experiences, taking time out to mentor students on points of personal development, and assessing time management as well as control of the learning environment. Successful learning outcomes involve trust and partnership between faculty and students. However, it is incumbent on faculty to take the first step in this journey. Here we have highlighted several factors about the culture of the classroom and relationships between students and faculty. It is only through effective delivery of the curriculum (“how to do it”) that we can unleash the full potential of the curriculum design.

The Engineering Learning Process Methodology

Engineering is a disciplined, creative process that involves both art and science. Learning engineering involves construction of fundamental engineering knowledge, developing necessary engineering and creative skills, experiencing engineering processes, and practicing the use of engineering tools to achieve desired objectives and produce expected results. The Learning Process Methodology (LPM), has a long history in Process Education literature (see Apple, Ellis, Hintze, 2016; and Watts, 2018), and is tightly

connected to activity design for learning (POGIL, 2015). The stages and steps of the Engineering Learning Methodology can be illustrated as shown in Table 6.

The 15 steps of the Engineering Learning Process Methodology were evolved from the 14 steps of the Learning Process Methodology starting with the revised guidelines followed in the development of the two books (Ellis, Teeguarden, and Apple, 2013; Ellis et al, 2014). The Learning to Learn Math experience and the latest research findings on Learning to Learn, including Improving Learning Performance (Apple & Ellis, 2015) and Key Learner Characteristics for Academic Success (Apple, Duncan & Ellis, 2016), were used to create the Engineering Learning Process Methodology. This methodology takes on three perspectives - the design of the engineering experiences, the facilitation of the learning activities, and the learners constructing their engineering knowledge and skills. These elements, including the stages and steps from Table 6, should be a part of the mindset for program and course design as guidelines in design of the curriculum components and sequencing. These elements draw the student into the learning process, ensure that the learning activities develop the appropriate skills targeted for that experience, and allow the student to apply and reflect on these skills appropriately both within modules in a course and as they progress through the curriculum.

Table 6. Engineering Learning Process Methodology (ELPM)

Step	Action	Correlate to LPM Step(s)
STAGE 1: PREPARING TO LEARN (normally before class)		
Step 1	Purpose	1: Why
Step 2	Discovery (exploration stage)	2: Orientation
Step 3	Expectations for the learning performance	4: Learning Objectives 5: Performance Criteria
Step 4	What do you already know?	3: Prerequisites
Step 5	Required engineering language (the precision of its terminology, symbolic representations, and notation)	6: Vocabulary
Step 6	Information needed before and during the learning experience (reading assignment)	7: Information
Step 7	Learning resources	7: Information and Resources
Step 8	Are you ready?	8: Plan
STAGE 2: ACTIVELY LEARNING (during and extending after class)		
Step 9 (during class)	Classroom Activity (Process Education/POGIL learning activity)	
	Why?	1: Why
	Learning objectives	4: Learning objectives
	Performance criteria	5: Performance criteria
	Additional critical information for the activity	7: Information
	Plan: lays out recommended sequence of tasks	8: Plan
	Models: critical examples to analyze	9: Models
	Critical Thinking Questions	10: Critical thinking questions
Step 10 (after class)	Demonstrate your understanding (may be started during class)	11: Transfer/application
Step 11	Hardest problem: generalizing the knowledge	11: Transfer/application
Step 12	Making it matter: problem solving	12: Problem solving
STAGE 3: IMPROVING THE PROCESS AND EXTENDING THE LEARNING		
Step 13	Identify and correct the errors	13: Self-Assessment (focus on content)
Step 14	Learning to learn engineering	13: Self-Assessment (focus on discipline process)
Step 15	Assess learning performance	13: Self-Assessment (focus on engineering learning process)

Case Studies of Implementing Learning to Learn have produced transformational learning
The scholarship and practice of learning to learn has advanced in summer Learning to Learn Camps over 20 years (Apple, Ellis & Hintze, 2015). Students' learning and problem solving performances advanced remarkably as a result of the learning to learn camp experiences. Many of these Learning to Learn Camps became very STEM oriented with a greater focus on learning to learn math and engineering. These camps helped start the student transformation into a PQCEL to counteract these engineering risk factors in order to achieve success (Perkins, 2018).

STEM Learning to Learn Camps

During the five years of the NSF funded STEM UP program (students with ACT scores 15-19) at Hinds Community College - Utica Campus, the Learning to Learn Camps evolved into a very strong implementation of learning to learn STEM. While these Learning to Learn Algebra Camps continued to develop general learner characteristics of a quality collegiate learner, they also developed Engineering learner characteristics paramount for success in STEM. Over the five years, 60 percent of the annual cohorts transferred to 4 year STEM programs within 2 years. This grant has been renewed for another 5 years. Additionally, a pilot of 65 incoming "area of interest" students were brought through a Learning to Learn Engineering Smart Grid Institute as a preparatory program before entering as freshmen. Examples of a few of the special learner characteristics developed include 1) embracing failure as part of learning, 2) seeking to know why something works, 3) validating their own learning, 4) communicating STEM, 5) increasing metacognition of their Engineering learning performance, 6) valuing productive struggle, 7) developing self-confidence by leveraging failures, 8) teaching others, 9) reading technical resources, and 10) building language and notation in Engineering. The outcomes of the students mindsets and engineering learning skills can be reviewed at http://www.pcrest3.com/llc/words2014.htm for both programs.

Course-Based Implementation of Learning to Learning Engineering - Learning to learn can also be incorporated into any content course. For example, an Introduction to Engineering Course implemented the following approaches into the *culture* of the course through the use of extensive computer applications within the course to grow engineering *learner characteristics* (Utschig, 2005). Approximately one-third to one-half of class time in a three-credit, semester long course was devoted to learning to learn specific computer skills essential to engineering success. These skills were introduced using the computing tools MS-Word, MS-Excel, and MATLAB. *Learning to learn* using these engineering tools was completely integrated into the course through assignments targeting fundamental *engineering knowledge* and requiring important elements of real *engineering performance*.

Emphasis within the learning environment was placed on cooperative learning, frequent formative assessment feedback, integrative learning to merge computing and *engineering knowledge*, self-assessment, and generalizing knowledge across engineering, mathematics, and science contexts through the use of analytical problem-solving tasks and simple design projects. Engineering *learner characteristics* targeted in the course included: tool user, mathematical modeler, solution producer, prototyper, documenter, analytical thinker, unit analyst, team player, and communicator.

Results from the course included an 80% retention rate into the subsequent year with an engineering major, and high ratings for course effectiveness with comments such as these on course evaluations: “This should be a six credit class. The workload seems like it. Keep it up.”, “Overall, it is very informative. The class was also very conducive to learning.”, and “Most especially I am grateful that I can use the computer better now.” (Utschig, 2005).

Conclusions

To realize the vision of the Engineer of 2020, enhance engineering program’s abilities to effectively address ABET criteria, achieve student outcomes, and increase retention and graduation rates, a developmental approach for learning to learn engineering is presented. Founded on many learning to learn research efforts and practices, the presented approach along with a learning to learn engineering conceptual framework, risk factors, and engineering learning process methodology are discussed to guide program design and delivery, and to illustrate how learners of engineering can learn more effectively.

The paper, (1) offers premises that engineering knowledge has multiple forms, that knowledge can be developed through multiple levels, and that graduating engineers should be able to generalize and transfer knowledge to new engineering contexts; (2) describes the relationship between improved learning of engineering knowledge and improved engineering performance (3) summarizes risk factors confronting engineering students, (4) offers profiles describing what quality collegiate and quality engineering learners look like, (5) describes how a transformed engineering education culture supports this developmental approach (6) produces a model of the engineering learning process applicable for curriculum design and active learning, and (7) offers case studies demonstrating how these components tie together.

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The references for this paper are available online.

Notes

CBI 010
10:45am

Role of the Academy in the iGen Age

Speaker: Matthew Watts, Tidewater Community College

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=190

As President-Elect of the Academy of Process Education and one of its younger members, Matthew Watts will discuss the generational differences that affect teaching and learning in higher education. Why are current generations different than past generations? How are teaching best practices changing to meet the needs of contemporary students? How do we get younger faculty more involved in educational research and professional development? Most importantly how do I get my students to put their phones down for an hour and pay attention! Matthew will combine personal experience with Process Education principles to create a shared vision of student success.

Notes

205 (BISL)
2:00pm

iGens and the Rest of Us: Seeking Cultural Competence to Improve Student Success

Facilitators: Mary Moore, University of Indianapolis
and Ken Colburn, Butler University

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=151

OVERVIEW

The first part of our workshop will summarize and critically examine current research on iGen/Gen Z students with a focus on implications for teaching and learning. How do iGen/Gen Z students differ from earlier Generation Y students and what opportunities and challenges do they pose for Process Educators? How can teachers employ this understanding to better engage and facilitate learning outcomes with iGen/Gen Z students? For example, iGen/Gen Z students are typically described as major users and consumers of social media, are attached to digital mobile technologies such as smartphones and laptops, show a limited interest in "adulting" while maintaining a desire for extending play and security, and exhibit a strong need for safe and comfortable environments. How do these characteristics relate to developing effective teaching strategies? The second part of the workshop will explore teaching strategies and examples of how to address the specific characteristics of iGen/Gen Z students in standard sociology classes, including Introductory Sociology. What does flipping the classroom mean in the age of iGen/Gen Z students in as much as research suggests students avoid reading traditional textbooks and report spending less time on homework? One of us will report on their experience using an eBook—actually, a "Smart" book—version of a traditional introductory textbook. We argue that this Smart book, offered as part of a complete online learning and testing system to replace a traditional textbook, is ideally suited for iGen/GenZ students. Additional class teaching activities and assignments will be shared to highlight ways of turning the characteristics of iGen/Gen Z students into assets for learning and teaching.

LEARNING OUTCOMES

- Identify key characteristics of iGen students.
- Explore how the characteristics of iGen students relate to student learning and performance.
- Analyze student feedback from an Introductory Sociology course that used a "Smart" book system to unlock learning and growth among iGen students.
- Propose teaching activities and assignments that are meant to turn the characteristics of iGen students into assets for learning.

PLAN

- Highlight the characteristics of iGen students from research literature. (15 minutes)
- Work in pairs to map characteristics of iGen students to how they best learn and perform. (15 minutes)
- Provide an overview of a "Smart" book system and its pilot use in an Introductory Sociology course. (20 minutes)

PLAN (con't)

- Share assessment feedback from students in the pilot course about their course learning experience. (10 minutes)
- Share other examples of course activities that build on the characteristics of iGen students. (10 minutes)
- Work in pairs to propose additional learning experiences that might turn the characteristics of iGen students into assets for learning. (15 minutes)
- Complete a workshop assessment form. (5 minutes)

Notes

Deliberately Developmental Organizations - an Interactive Book Review

CBI 300
2:00pm

Facilitator: Wendy Duncan, California Health Sciences University

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=154

OVERVIEW

An Everyone Culture by Robert Kegan and Lisa Lahey will cause you to rethink the basic notion of people-development in organizational life. A Deliberately Developmental Organization (DDO) is organized around the deceptively simple but radical conviction that organizations will best prosper when they are deeply aligned with people's strongest motive, which is to grow. This means more than consigning "people development" to high-potential leadership-development programs, executive coaching, or once-a-year retreats. Deep alignment means fashioning an organizational culture in which support of people's ongoing development is woven into the daily fabric of working life and visible in the company's regular operations, daily routines, and conversations.

Notes

Service Learning and Outreach

CBI 010
2:00pm

Facilitator: Shawn Clerkin, Gannon University

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=157

ABSTRACT

This session includes papers that explore how service learning benefits the community, helps realize important learning outcomes, and stimulates personal reflection about learning/growth associated with a real-world situation.

Note that abstracts of papers in this session are included if full papers were not available as of May 1. Also note that papers for this session are abbreviated if longer than 12 pages in length. Full papers for this session may be found online in the resources available for this session.

PANELISTS

Notes

Assessment of Self-Regulated Learning in Senior Capstone Design

Wookwon Lee Department of Electrical and Computer Engineering, Gannon University

Abstract

The Senior Capstone Design in our department is administered through two semesters for engineering design from inception to demonstration of a working prototype. A successful completion of a senior design project is attributed to key aspects of the self-regulated learning (SRL) which is defined as a complex repository of knowledge and skills for planning, implementing, monitoring, evaluating, and continually improving the learning process. This paper examines the level of self-regulated learning, especially in our first Senior Capstone Design course where students are responsible for carrying out project activities primarily on their own with some guidance from faculty members serving as technical advisor.

Introduction

Self-regulated learning (SRL) has been known to educators for several decades [1]-[5]. The self-regulated learning is defined as a complex repository of knowledge and skills for planning, implementing, monitoring, evaluating, and continually improving the learning process [6]. As students are known to use the self-regulated learning processes [7], it is important for educators to develop proper insight into student's self-regulated learning activities and to design teaching interventions that can promote student's metacognitive awareness. Particularly in engineering education, the self-regulated learning has been studied in recent years that involved development of a survey instrument [8] and a pilot study to evaluate the level of self-regulated learning activities in an engineering capstone design course [6]. Based on five typical steps for the engineering design [9], i.e., problem definition, conceptual design, preliminary design, detailed design, and design communication, this pilot study was conducted primarily on four major features of SRL – task interpretation, planning strategies, cognitive actions, and monitoring/fixed-up. However, this study was limited to two project teams in a senior capstone design class. This paper aims to further evaluate the level of SRL activities involving more project teams and compare the results with the previous results.

The senior capstone design in our Electrical and Computer Engineering (ECE) department is administered through two semesters for engineering design from inception to demonstration of a working prototype. In the first semester of the senior year, the course covers topics related to engineering design such as design fundamentals, application of design principles to a design problem, determination of a complete problem definition/specification, development of a conceptual design and a preliminary design with possible alternatives, as well as establishing a project schedule and tentative test plan. Along with those technical topics, also discussed are ethics and ethical standards and impact on engineering decisions, and effective communication. Especially for the engineering design aspects, the course covers all technical aspects of a complete design process for electrical, computer, and/or software systems, ranging from marketing and engineering requirements, and functional decomposition to design specifications and design verification. Through multiple phases of completing these tasks, students are guided to work in a team setting.

This paper examines the level of self-regulated learning (SRL) in our senior design, especially in the first Senior Design course where students performs project formulation and ultimately produce design specifications that will serve as the basis of project implementation in the second Senior Design course. In its setting, this course requires the students to carry out engineering design activities primarily on their own, with some technical guidance, as needed, from faculty members serving as technical advisors as well as feedback from the course instructor. As such, this course provides a suitable setting that promotes SRL in order to perform well in the course. The remainder of this paper is organized as follows: The second section below provides an overview of the course setup that facilitates engineering design activities, as well as a brief description of design projects. In the third section, a survey instrument for evaluation of student use of SRL is described along with some characteristics of the survey participants. Survey results and analysis are also provided in that section. Finally, concluding remarks are provided in the fourth section.

Senior Capstone Design Course Setup

Our first Senior Design course requires students to demonstrate skills in complete design process for electrical, computer and/or software systems development that include self-directed requirements gathering, assimilate information, concept design, specification writing, and de-

sign verification. Student activities in this course for their project include 1) project selection and need identification, 2) requirement specification, 3) functional decomposition, 4) project management, 5) preliminary abstract design, 6) detailed design on paper, 7) simulation and testing for test plan, and 8) system design specifications. Along the course of the project activities, other topics are covered that are not directly related to the engineering project such as ethics and effective speech/oral communication skills. Not covered for the SRL evaluation presented in this paper, the second Senior Design course requires students to implement a prototype system of their proposed project adhering to the design specifications, develop a test plan, and incorporate failure modes and effects analysis (FMEA) as part of the risk management and necessary design changes, if any. The ultimate outcomes of the second senior design course include a complete design document and the presentation of their final prototype system. One can easily notice that this sequence of engineering design phases adopted in our senior design is similar to the typical five steps mentioned earlier except that the detailed design phase is effectively further broken down to several additional steps such as conducting simulation and testing and devising a test plan as well as producing design specifications before actually implementing the project. Table 1 below summaries the engineering design steps in the previous pilot study and our study in this paper.

Students are guided to assume ownership of their activities and performance in class. Aside following the engineering design steps, each project team is required to formulate its project to be sufficiently complex enough for the manpower in the team for balanced contributions by each team member to the project. Individual responsibilities and tasks for team projects are known to all team members when each team completes an initial version of functional decomposition and its corresponding project management plan. For student performance in the course, both team performance and individual performance are evaluated through various assignments. While team deliverables are mostly suitable for evaluating team performance, individual performance is also evaluated through weekly reports on individual contributions.

Projects and Teams

Our senior design students are required to be able to formulate and propose a project. In the spring semester of their junior year, right before coming into the first Senior Design course, our students take a 1-credit preparatory course to learn to formulate a project idea individually (as opposed to in a team effort). Then, from a combined pool of faculty-sponsored projects, industry-sponsored projects, and student-proposed projects, a few project ideas are tentatively selected as possible senior design projects along with tentative formation of teams around those project ideas. Within the first month of the fall semester of their senior year, these candidate projects are further reviewed and team formation is finalized for approval. In fall 2017, there were 17 seniors in the Senior Design course and the following seven projects were chosen, each for a group of 2 or 3 students:

a) *LUIGEE: Control of Walking* – As part of a faculty-sponsored project for a self-balancing humanoid robot referred to as the Locomotive Underactuated Implement Guided via Elastic Element (LUIGEE), the objective of this project is to make the LUIGEE do squatting just like human-beings do. Two students are working on this project.

b) *Raspberry Pi Smart Mirror* – The purpose of the project is to design a smart mirror using the Raspberry Pi that can display news and weather updates, by automatically detecting the person standing in front of the mirror. Two students are working on this project.

c) *Autonomous Racing Car 2* – This is a faculty-sponsored project where the team is charged to improve the overall car-racing capability by enhanced speed-

Table 1. Engineering Design Steps

Previous Pilot Study	Current Study in This Paper
Problem definition	Project selection and need identification, requirement specification
Conceptual design	Functional decomposition (into subsystems)
Preliminary design	Preliminary abstract design, detailed design on paper of subsystems
Detailed design	Simulation and testing of subsystems, test plan, design specifications, FMEA
Design communication	Final project report, presentation of a working prototype system

control and cornering on the racing track intended for the Freescale Cup. The racing car has dimensions of 9.85in (W) x 15.75in (L) x 12in (H) and three students are working on this project.

d) *American Football Review System for First Downs & Touchdowns* – The purpose of the project is to design a review system for first downs and touchdowns in American football. With a limited functionality, this review system consists of two different units i.e. a football unit for detecting the crossing of the downs lines and a scoring unit for keeping track of the game score. Two students are working on this project.

e) *Solar Charging Station* – The purpose of this project is to design a system that uses a renewable energy resource to generate electricity and make it available on campus to charge cell-phones, laptops, and other electronic devices. A locking mechanism is also included to protect user devices. Two students are working on this project.

f) *Dynamic Traffic Network* – The objective of this project is to develop a Dynamic Traffic Network (DTN) based on a client-sided portable embedded-system device, referred to as the Vehicle Behavioral Interface (VBI), and a server. Intended to lay out the foundation of a future real-time traffic network, this project aims to provide drivers with faster, safer, and more intuitive on-road-real-time traffic information. Three students are working on this project.

g) *Solar Powered Tent* – The purpose of this project is to create a working prototype of a solar-powered tent. This tent is intended to enhance the camping experience; and is designed to use natural energy (i.e., solar energy in this case) to provide light within the tent, charging stations for mobile phones, and a distress signal in cases of grave danger. Three students are working on this project.

Evaluation of Student Use of SRL Survey Instrument and Participants

For the survey instrument, five SRL features are adopted from [8] which include 1) task interpretation, 2) planning strategies, 3) cognitive actions, 4) monitoring and fix-up strategies, and 5) criteria of success. Each SRL feature is further split into two subcategories of activities in design process and team management. The resulting ten categories of questionnaire items are a subset of the Engineering Design Metacognitive Questionnaire (EDMQ) [8] and are considered suitable for evaluating use of SRL while students carry out project activities on their respective senior design projects. The five engineering design steps adopted in the previous pilot study [6][9] closely match the engineering design steps in our senior design as compared in Table 1 above. For the completeness of the context in this paper, those ten categories of questionnaire items are provided below in Tables 2~11. Four possible responses to the questionnaire items are converted to numerical scores on a scale of 1 to 4 as follows: 1: Almost Never; 2: Sometimes; 3: Often; 4: Almost Always.

All 17 students in the senior design class are invited to participate in the survey including 1 female and 16 male students; 7 of them are domestic students and 10 of them are international students. Their cumulative GPAs at the beginning of fall 2017 vary widely ranging from 2.23 to 3.99 on a 4.0-point scale. Their overall performance in the course determined in the end of the fall 2017 semester vary widely as well, ranging from a grade of C to a grade of A+. Due to the anonymity of the survey, no further analysis on any mapping or correlation between the survey results and individual academic performance data is performed.

Table 2. Task Interpretation: across Design Phases

Design phase	Questionnaire item
Q1: Problem definition	When I am defining my design problem, I need to identify the design goals.
Q2: Conceptual design	When I am generating solution ideas, I need to look for possible design alternatives.
Q3: Preliminary design	When I am working on my selected design, I need to build and analyze the chosen design model.
Q4: Detailed design	When I am finalizing my design, I need to refine and optimize the investigated design.
Q5: Design communication	When I am communicating my design solution, I need to communicate the processes and outcomes of my final design in detail.

Table 3. Task Interpretation: across Team Management Components

Management Component	Questionnaire item
Q6: Time	When I am working with my team… I need to ensure that my contribution to the team will deliver the design tasks in a timely manner.
Q7: Resources	When I am working with my team… I need to seek relevant resources (e.g., materials/tools, information, skills, funding) needed.
Q8: Teamwork	When I am working with my team… I need to do my fair share in an overall team's effort to complete the project.

Table 4. Planning Strategies: across Design Phases

Design phase	Questionnaire item
Q9: Problem definition	As I start defining my design problem, I read the design description (or brief) to identify design goals.
Q10: Conceptual design	As I start generating solution ideas, I identify my options to come up with a better design solution.
Q11: Preliminary design	As I start working on my selected design, I collect the design requirements, assumptions, or specifications for functions and the chosen design to develop a design model.
Q12: Detailed design	As I start finalizing my design, I identify necessary adjustments needed to optimize the chosen design.
Q13: Design communication	As I start thinking about how to communicate my design solution, I identify, gather, and organize the information that needs to be communicated to various audiences such as my client, teacher, friends.

Table 5. Planning Strategies: across Team Management Components

Management Component	Questionnaire item
Q14: Time	As I start working with my team, I ensure that I have a working schedule to follow throughout the design process.
Q15: Resources	As I start working with my team, I identify potential resources (e.g., materials/tools, information, skills, funding) to complete the design project.
Q16: Teamwork	As I start working with my team, I identify and clarify my part in the team's effort to arrive at a solution.

Table 6. Cognitive Actions: across Design Phases

Design phase	Questionnaire item
Q17: Problem definition	When I am defining my design problem, I am collecting relevant measurements (or quantifications) of the design goals.
Q18: Conceptual design	When I am generating solution ideas, I am searching for potential ways to better solve my design problems.

Design phase	Questionnaire item
Q19: Preliminary design	When I am working on my selected design, I am developing and using physical (or mathematical) models (representations) that represent the actual chosen design.
Q20: Detailed design	When I am finalizing my design, I am fine-tuning the design to produce better performance.
Q21: Design communication	When I am communicating my design solution, I am drafting a final design report, creating drawings, or developing an oral presentation.

Table 7. Cognitive Actions: across Team Management Components

Management Component	Questionnaire item
Q22: Time	When I am working with my team, I am estimating the time needed to accomplish each part of the design tasks.
Q23: Resources	When I am working with my team, I am searching for, selecting, and using working materials/tools, information, and funding sources we need.
Q24: Teamwork	When I am working with my team, I am negotiating the role that I have to play and tasks that I have to do with my teammates.

Table 8. Monitoring and Fix-Up Strategies: across Design Phases

Design phase	Questionnaire item
Q25: Problem definition	While I define my design problem, I am clarifying the design goals with design team/client.
Q26: Conceptual design	While I generate solution ideas, I am determining whether I need to look for alternative design solutions.
Q27: Preliminary design	While I work on my selected design, I am judging whether my design model reflects my final design.
Q28: Detailed design	While I finalize my design, I am judging whether further adjustments are needed to improve the design performance.
Q29: Design communication	While I communicate my design solution, I am thinking about how I could improve the design communication and finalize the delivery of those communications.

Table 9. Monitoring and Fix-Up Strategies: across Team Management Components

Management Component	Questionnaire item
Q30: Time	While I work with my team, I am thinking about how much time is left, what I still have to do.
Q31: Resources	While I work with my team, I am asking myself if I have found and selected appropriate resources.
Q32: Teamwork	While I work with my team, I am asking myself whether the negotiation I made to determine my role in my team is fair and making necessary adjustment if needed.

Table 10. Criteria of Success: across Design Phases

Design phase	Questionnaire item
Q33: Problem definition	After defining my design problem, I know that I have done a good job when I am able to develop a list of final design goals.
Q34: Conceptual design	After generating solution ideas, I know that I have done a good job when I am able to consider all possible design solutions.
Q35: Preliminary design	After working on my selected design, I know that I have done a good job when I am able to develop a model that reflects the actual final design.
Q36: Detailed design	After finalizing my design, I know that I have done a good job when I am able to come up with a detailed and optimized design.
Q37: Design communication	After communicating my design solution, I know that I have done a good job when I am able to produce a final written design report, final drawings, or oral presentation to the client containing design information.

Table 11. Criteria of Success: across Team Management Components

Management Component	Questionnaire item
Q38: Time	After working with my team, I know that I have done a good job when… I ensure that my contribution had helped my team finish our design tasks on time.
Q39: Resources	After working with my team, I know that I have done a good job when… I find and use relevant resources (e.g., materials/tools, information, skills, funding).
Q40: Teamwork	After working with my team, I know that I have done a good job when… I am able to do my fair share in my team's accomplishments.

Survey Data and Analysis

The survey was completed by 16 students among those 17 students in the class. For a total of 40 questions in 10 categories, average scores and standard deviations are calculated for individual questions and also for each category. The results are summarized in Table 12 where the survey categories are labeled by Roman numerals and individual questions are sequentially labeled with a prefix Q. For a comparison with the results in the literature, the averages and standard deviations from the previous pilot study with two senior capstone design projects, entitled Patient Bathroom Lift (PBL) and Low-Cost Wheelchair (LCW), respectively [6] are also shown in the table.

To develop more intuitive understanding from these numerical results, we consider that the average scores greater than or equal to 3.0 and less than 3.5 (i.e., $3.0 \leq$ average score $x < 3.5$) represent a reasonable level of SRL use and average scores below 3.0 represent room for improvement, while an average score greater than or equal to 3.5 is considered as highly desirable. However, it should be noted that using an average score of 3.0 as the threshold is our own choice derived, without rigorous validation, from the conversion of qualitative survey results into numerical scores, i.e., 1: Almost Never; 2: Sometimes; 3: Often; 4: Almost Always, assuming that participant responses with Often or Almost Always to individual questionnaire items indicate a good use of the SRL skills implied in the individual questionnaire items.

As shown in Table 12, for Task Interpretation across Design Phases (i.e., Category I), our students (an overall average score of 3.09) and the PBL project participants (an average score of 3.19) used a reasonable level of SRL while the LWC project participants (an average score of 3.55) used a highly desirable level of SRL skills for that category. From the other numerical results in Category I, we note that our students could further improve in items of Q2 (to look for possible design alternatives) and Q4 (to refine and optimize the investigated design) while a highly desirable level of SRL is attained in item Q5 (to communicate the processes and outcomes). Also, the standard deviations for all items in this category are relatively high (0.61~0.93) which indicate a mixed level of SRL uses in task interpretation during design phases. Similar observations can be made with the standard deviations for the PBL and LWC project participants.

Table 12. Summary of Survey Results: Average and Standard Deviations

	Av.	Std. Dev		Av.	Std. Dev		Av.	Std. Dev		Av.	Std. Dev
I. (TI) Task Interpretation: Across Design Phases			**II. (TI) Task Interpretation: Across Team Management Components**			**III. (PS) Planning Strategies: Across Design Phases**			**IV. (PS) Planning Strategies: Across Team Management Components**		
Q1	3.00	0.61	Q6	3.38	0.78	Q9	3.69	0.58	Q14	2.88	0.78
Q2	2.88	0.93	Q7	3.44	0.61	Q10	3.44	0.70	Q15	3.19	0.81
Q3	3.13	0.81	Q8	3.69	0.58	Q11	3.00	0.71	Q16	3.56	0.70
Q4	2.94	0.83				Q12	3.13	0.93			
Q5	3.50	0.71				Q13	3.38	0.60			
Overall	3.09	0.81	**Overall**	3.50	0.68	**Overall**	3.33	0.75	**Overall**	3.21	0.82
PBL	3.19	0.82	**PBL**	3.39	0.19	**PBL**	3.04	0.82	**PBL**	2.72	0.19
LWC	3.55	0.67	**LWC**	3.73	0.12	**LWC**	3.40	0.69	**LWC**	3.60	0.35

V. (CA) Cognitive Actions: Across Design Phases			**VI. (CA) Cognitive Actions: Across Team Management Components**			**VII. (MF) Monitoring and Fix-Up Strategies: Across Design Phases**			**VIII. (MF) Monitoring and Fix-Up Strategies: Across Team Management Components**		
Q17	2.69	0.77	Q22	3.19	0.63	Q25	3.25	0.66	Q30	3.31	0.85
Q18	3.13	0.70	Q23	3.13	0.78	Q26	3.06	0.83	Q31	3.31	0.68
Q19	3.00	0.87	Q24	3.31	0.85	Q27	2.94	0.75	Q32	3.00	1.00
Q20	3.13	0.86				Q28	3.25	0.66			
Q21	3.38	0.60				Q29	3.06	1.03			
Overall	3.06	0.80	**Overall**	3.21	0.76	**Overall**	3.11	0.81	**Overall**	3.21	0.87
PBL	2.89	0.91	**PBL**	3.22	0.78	**PBL**	3.05	0.83	**PBL**	3.11	0.73
LWC	3.32	0.70	**LWC**	3.50	0.71	**LWC**	3.46	0.7	**LWC**	3.36	0.78

IX. (CS) Criteria of Success: Across Design Phases			**X. (CS) Criteria of Success: Across Team Management Components**		
Q33	2.87	0.88	Q38	3.40	0.80
Q34	2.87	0.88	Q39	3.33	0.79
Q35	3.27	0.85	Q40	3.60	0.61
Q36	3.07	0.68			
Q37	3.13	0.88			
Overall	3.04	0.86	**Overall**	3.44	0.75
PBL	N/A	N/A	**PBL**	N/A	N/A
LWC	N/A	N/A	**LWC**	N/A	N/A

For Task Interpretation across Team Management Components (i.e., Category II), our students (an average score of 3.50) and the LWC project participants (an average score of 3.73) used a highly desirable level of SRL skills in the team management components, while the PBL project participants (an average score of 3.39) used a reasonable level of SRL skills. We note, however, that one item (Q8) played a key role to raise the overall average score to 3.50 in our student case. Another noticeable aspect is that the standard deviations for the PBL and LWC participants are considerably lower than one for our students.

In a similar fashion, additional observations can be easily made on the numerical results in the other categories. Some of the highlights that we noticed include 1) the average scores in all categories for our students range from 3.04 to 3.50 which indicate our students generally use a reasonable level of SRL skills; 2) our students show strength in some individual items such as Q8 (to do my fair share while working with my team), Q9 (to read the design description to identify goals), Q16 (to identify and clarify my part in the team's effort), and Q40 (to do my fair share in team's accomplishments); 3) our students would benefit if further improvement could be made in some individual items such as Q14 (to have a working schedule to follow through the design process), Q17 (to collect relevant measurements/ quantifications of the design goals), Q27 (to judge whether my design model reflects my final design), Q33(to develop a list of final design goals), and Q34 (to consider all possible design solutions).

Concluding Remarks

We have presented a case study of evaluating the self-regulated learning in senior capstone design utilizing a survey instrument that has been recently validated for engineering design. Our survey results were compared with the existing results reported in the literature to develop intuitive understanding about student use of self-regulated learning skills in senior capstone design. Although these survey results and analysis in this paper may still be a limited case study, we believe that a proper interpretation of the survey results can certainly help engineering educators develop teaching interventions that effectively promote student awareness and use of SRL.

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Impact of Higher Education Culture on Student Mindset and Success

presented by Steven Beyerlein, University of Idaho

Student mindsets and academic behaviors are strongly influenced by an institution's culture, its values, faculty mindsets and prevalent teaching and learning practices. From recent Process Education-based research centered on possible ways for post-secondary educational institutions to become more effective, 14 cultural aspects that define an educational culture were identified and differentiated in the Transformation of Education (Hintze-Yates et al., 2011). Adopting these 14 cultural aspects as the theoretical framework, this paper articulates a transformation of traditional educator practices to a set of "research based best practices" that contributes significantly to the development of quality collegiate learners. Thus, this discussion has a two-fold objective: (1) to contrast traditional and transformational educational cultures; and (2) to articulate how the impact of transformational practices can shift student mindsets toward successful academic behaviors. Accordingly, our theoretical inquiry focuses on five distinct elements: institutional values, faculty mindsets, faculty practices, student mindsets, and learner characteristics for each of the referenced 14 cultural aspects. Analysis of the traditional culture and its teaching and learning traits reveal reasons that contribute to and exacerbate student risk factors (Horton 2015). In contrast, analysis of the transformational culture and its teaching and learning traits demonstrates how development and enhancement of success factors (Apple, Ellis & Hintze, 2015) can help mitigate those risk factors.

(Complete article published in 2018 issue of the *International Journal of Process Education*.)

Notes

Faculty Development: Essential for Engaging Generation Z Effectively

Janet Vigna, Heather Gulgin, and Julie White, Grand Valley State University (Online presentes)

As faculty, we have been well-trained in keeping up to date on the most recent research in our professional disciplines. In addition, we attend workshops that train us in the newest techniques (Clickers, Gaming Apps, etc.) to interest and engage our students in the most relevant applications of content. However, more than ever before, and particularly with many Generation Z students, the reasons that students are struggling in the classroom don't have much to do with whether faculty are great scholars in their disciplines or are using social media as a pedagogical tool. Faculty need training in dealing with students that have heightened levels of anxiety. They need to understand why students aren't finding academic help, even when the resources are readily available, or why students struggle to read a 20-page chapter for understanding. In order to fully support each Generation Z student, faculty development should include tools to understand and address those student challenges that are unrelated to specific content. Additionally beneficial, are faculty development experiences that promote self-growth and reflection on the part of the faculty member, to help remove preconceptions that are barriers to fully promoting student success. This paper will share lessons learned from faculty development training for an academic recovery camp, and how they may effectively inform faculty development for classroom application, particularly for Gateway and other first-year courses.

Notes

205 (BISL)
4:00pm

Researching the Recovery Course

Facilitator: Dan Apple

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=161

OVERVIEW

The Academic Recovery Course has been instituted now for eight years, across four different institutional contexts, and delivered over twenty times. The data produced for research purposes are varied and distributed. This workshop is to build a research program and team to put together a plan for analyzing past and future recovery courses to show the power of Process Education.

LEARNING OUTCOMES

- Share some of the current explorations of possible research ideas
- Explore what faculty and administrators would like answered about the recovery course
- Identify the top five research questions for exploring over the next two years
- Produce a strategy for tackling each question that can be implemented in recovery courses

PLAN

1. Review and expand the current list of research ideas (15 min)
2. Break into five or more teams based upon workshop size to let people migrate to an area of interest. (5 min)
3. Each group selects a team leader and begins investigating past work to determine what can be pulled out (20 min).
4. Each group produces a research plan for the next three years. The plan should include: (20 min)
    - The top three research inquiry questions - Significance and broader impact
    - Data Plan and rationale for these requirements
    - IRB issues that need to be addressed
    - The projected impact of this research
4. Teams share their findings and make recommendations for integrate these into a research program. Consider issues of leadership, projects, proposals, scholarly publications and a set of supporting tasks for the next year. (25 min)
5. Complete a workshop assessment form (5 min).

RESOURCES

The website will provide past results including self-growth papers, risk factors, curriculum, GVSU recovery course, WGU report, past papers (including 25 years of Process Education)

Notes

CBI 300
4:00pm

Teaching Critical Thinking

Facilitator: Joann Horton

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=164

OVERVIEW

Research shows that a significant number of students have at-risk factors that negatively impact their academic success. For example, some students have adopted the at-risk behavior of memorization as a learning strategy because they have limited thinking skills. They believe that memorizing facts and data will make them knowledgeable and successful. They are unable to contextualize those facts and find extrapolating them to new situations is confusing. One could say that they do not know how they think. The ability to think critically is vitally important for success in all walks of life. It is an essential skill for elevating the performance of students as well as lifelong learners. As facilitators of learning, we are constantly building our toolkits to guide students in how to learn effectively. During this workshop, you will elevate your personal performance through a critical thinking practice session based on a pilot with WGU Generation Xers, Millennial and iGeneration students who took the recovery course. Come prepared to be challenged as you elevate your performance and build skills to teach at-risk students how to become more effective critical thinkers and learners.

LEARNING OUTCOMES

1. Increase understanding of risk factors that impact student learning and growth
2. Increased awareness of resources available for conceptualizing how to elevate student critical thinking skills as part of a growth mindset
3. Identify key strategies for assisting students in improving their critical thinking performance

PRE-READING

Faculty Guidebook, 2.2.5 Overview of Critical Thinking

IJPE (2015), Identifying At-Risk Factors That Affect College Student Success

- What is the relationship between risk factors (identify 3) and academic success?
- What are the 3 top risk factors that your students exhibit and which noncognitive success factors do they relate to?

Learning to Learn: Becoming A Self-Grower, Metacognition: Thinking about My Thinking

How does elevating knowledge impact the development of metacognitive skills?

PLAN	1. Greeting and organization of session (5 min) 2. Assess what participants were able to gain from readings (5 min) 3. Share risk factor handout - Critical At-Risk Behaviors That Impact College Success. Consider the question: How do risk factors affect a student's identity? Performance? (5 min) 4. Gather anecdotal information about participants' knowledge of risk factors and experience in elevating student critical thinking performance (10 min) 5. In teams of four, discuss the following question: Given set of risk factors, which ones are most operative in helping students elevate their thinking performance and why? Reports by spokespersons (10 min) 6. In teams of four, (a) select a critical thinking question to elevate from the handout and (b) identify the challenges that student might have in initially elevating their responses to critical thinking questions. Reports by spokespersons (10 min) 7. Present PowerPoint on how to elevate student performance in responding to critical thinking questions (10) min 8. In teams, develop a metacognitive response to the critical thinking question selected above. Create a list of insights on elevating critical thinking performance. (20 min) 9. Share response and insights gained with all workshop participants (spokespersons) (10 min) 10. Conduct workshop assessment & closure (5 min)
RESOURCES	1. Critical At-Risk Behaviors Impacting College Success (from 017 AAC&U Conference) 2. Levels of Learner Knowledge Chart (p.322); Elevating Knowledge Methodology (p.324); Elevating My Knowledge Worksheet (p. 314); Generalizing (p. 329)—all available online

Critical At-Risk Behaviors that Impact College Success

from Horton, J. (2015) Identifying at-risk factors that affect college student success. *International Journal of Process Education, 7*(1).

PERSEVERANCE

Lacks Self-Discipline
Easily distracted by social situations & opportunities for immediate gratification, putting off critical work

Procrastinates
Puts off all work that doesn't need to be done immediately

Irresponsible
Blames others for personal faults or failures; relies on others to make their decisions (helicopter parents)

Afraid of Failure
Shies away from situations where expectations are challenging & the probability of meeting them is low

No Sense of Self-Efficacy
Often feels overwhelmed, powerless, and/or victimized; "There's nothing I can do to change things"

ACADEMIC MINDSET

Financial Constraints
Often runs out of money; doesn't appreciate opportunity costs (e.g., getting a job to obtain more money means less available time for things like school)

Unmotivated
Listless and disinterested, finding little meaning in current activity and work

Aimless (No Clear Direction/Goals)
Deals with life reactively, hoping and wishing for change, but never planning or working for it

1st Generation College Student
Uses high school experience as the basis for setting expectations for college (parents are unable to provide a frame of reference for a realistic college experience)

Fixed Mindset
Accepts current performance level as permanent; lives up/down to projected performance/labels (e.g., "C-student")

LEARNING STRATEGIES

Teacher Pleasers
Constantly seeks direction from authority/teacher in order to please them; uses compliments to make the teacher happy and generous with grades (i.e., brown nosing)

Unchallenged (bored)
Feels that the learning challenges are far beneath their level of ability

Memorizes Instead of Thinking
Sees knowledge as sets of facts and data that should be memorized

Doesn't Transfer/Generalize Knowledge
Approaches each learning challenge as new & unique; fails to recognize old knowledge in new contexts

Highly Judgmental/Negative of Self
Constantly self-critical, seeing only mistakes and failures; not appreciating growth or improvement

Minimal Metacognitive Awareness
Unaware of one's own thought process; cannot articulate the process/approach to making decisions/solving problems

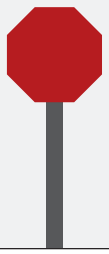
SOCIAL SKILLS

Non-Team Player
Disrupts groups, becoming either antagonistic/argumentative or silent (disengaged)

Insecure Public Speakers
Afraid of speaking in public; avoids speaking out in class

Lacks a Support System
Does not engage with others to address current or future social/psychological challenges; engages in negative behaviors (e.g., alcohol or drug abuse, violence, crime, etc.); "I'll solve my own problems"

Lacks Mentors/Role Models
Has no one from whom to seek advice or who could assist with career direction and educational goals



Notes

Learning Sciences

CBI 010
4:00pm

Facilitator: Sean Quallen, University of Idaho

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=167

ABSTRACT

This paper track explores elements in the process of learning including methodologies, educational theories, and research tools.

PANELISTS

Note that abstracts of papers in this session are included if full papers were not available as of May 1. Also note that papers for this session are abbreviated if longer than ten pages in length. Full papers for this session may be found online in the resources available for this session.

Notes

Use of Engineering Software Programs for Self-Directed Learning

Robert J. Michael and Davide Piovesan, Gannon University

Abstract

In the last two decades the simulation of mechanical systems went from being a research topic to a subject for mandatory courses. Thus, presenting the derivation of the equations of motion in a computer oriented fashion is paramount. Current teaching methods still emphasize a theoretical approach where complex engineering problems are first presented and solved analytically. This method is based on Bloom's taxonomy where the theoretical knowledge is provided first, followed by applications to engineering problems and implementation in computer models. An effective implementation technique can result from self-directed learning projects. This paper presents an approach to the introduction of engineering software where students learn to associate theoretical knowledge and computer implementation through self-directed learning. Two case studies involving multibody simulation and finite element analysis to optimize a thermoplastic caster wheel are presented. These self-directed learning projects also support the ABET criterion 3.k for Baccalaureate Degree in Engineering which state that students have "*an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice*". The projects are also useful in fostering life-long learning (ABET criterion 3.i.).

Introduction

Self-directed learning (SDL) is essentially the learner initiating the learning. The learner makes the decisions on how, when and where training occurs. The learner sets his or her own learning goals, objectives and methods. "The key to continuing professional development is learning, which comes about in different ways. It can be formal, non-formal or informal" [1]. Formal learning is the traditional instructor-based learning (IDL) where instructors and students meet in a formal classroom environment, material is covered by the instructor with homework assignments, exams, etc. [1,2]. Informal learning is where "the learner must decide what is to be learned, choose an approach to learning and independently manage the entire learning process" [2]. Based on this definition, SDL is essentially a form of informal learning.

Students who participate in SDL projects during their undergraduate education will develop the self-direction skill; knowing what to learn, how to search for it, and recognizing it when found [3]. This skill set and expertise will stay with the students as they transition into the professional world. Many examples of self-directed learning implemented in higher education can be found in the literature as the concepts of lifelong learning and self-directed learning gained importance [3 – 7]. Examples include open ended projects, design projects, senior design or capstone projects and the use of social networks to promote lifelong self-directed learning.

The need for self-directed learning becomes ever more important as the complexity and capability of engineering software increases. There is simply not enough class-room time to cover both the theoretical aspects of engineering and the practical software operation. The need to continuously improve one's self and prepare students for the professional world requires a basic understanding of engineering software programs such as finite element analysis and dynamic simulation. This paper presents two different SDL projects which help students gain familiarity with engineering software. A discussion on design and development of the projects and student results is presented.

Gardner Intelligence: Logical vs Spatial

When teaching graduate level engineering courses such as Machine Dynamics and Machine Design, a great discrepancy can be seen between students who have previously been exposed to a more theoretical based teaching approach compared to simulation

based practical approaches. The study of machines and mechanisms requires the solution of very complicated non-linear differential equations. These equations are used to calculate the position, velocity and acceleration of different parts of the mechanism or machine, as well as the force transmitted between different components. On the other hand, the construction of a mechanism requires the capacity to have a sense on how each component of the mechanism interact with the others spatially, and how the whole mechanism interacts with the environment. This requires a high degree of spatial intelligence. Students with higher spatial intelligence are able to imagine the position of the mechanism in different configuration looking at a static image. Conversely, students whose spatial intelligence has not been well developed or poorly trained encounter much difficulty when spatially representing complex mechanisms.

Students previously exposed to more mathematically heavy instructions have difficulties in mentally reconstructing the configuration of different mechanisms. We speculate that this is because they have not been exposed to many visual representations of these mechanical systems. Interestingly, individuals with high spatial intelligence can reconstruct the functioning of a mechanism by simply looking at a static image of the mechanism in a given configuration. On the other hand, employing representation of complex objects using moving images has been found to be beneficial across the border for the interpretation of complex spatial structures. This calls for the use of visual aid in the teaching of mechanism and in particular the use of multibody simulations where the movement of the mechanism can be both seen as a mechanism and analyzed with a graph at the same time.

We know there are enormous applications for developing learning plans when the prior knowledge of the individual is known. It would also be useful to know the learning process that the student has been exposed to. If the student has been exposed to the specific delivery of information aimed at resonating with one specific intelligence, the student would benefit to be presented with something familiar. Understanding what assumptions learners bring into their learning can be helpful for shaping the way that instruction unfolds. On the other hand, this does not need to be the only method to deliver the information to the student. The delivery of information can be planned across different methods that resonate with the different intelligences defined by Gardner [8].

The use of multibody simulation as a pedagogical tool was frowned upon for many years because the single focus of teaching was to make sure that the student would know the equations of motions and how the modification of each parameter within the equations would impact the final result. A multibody simulation was seen as a trial and error game that was not conducive to a well thought solution of a problem. Indeed, students that are not familiar with the theory underlying a problem could obtain simulated results rather quickly without months of painful solutions of equations. On the other hand, this brings a blind trust in the results that instead should always be questioned based on the underlying physical process. Multibody simulations are very useful to bypass the problems students might have in the spatial interpretations of a mechanism, thus training spatial intelligence, but should always be accompanied by the explanation of the fundamental theory governing the physical behavior of said mechanism.

By learning with only equations and graphs, a student sees only the math and not the physical behavior that the math describes. Thus, there is a disconnect between what the math means and the physical behavior in a physical system. A reliance on the mathematical side improves the logical intelligence but leaves the spatial intelligence untrained. By using simulations as a learning tool, we let students make connections themselves between the abstracted logic of mathematics and the represented behavior in a physical system. Furthermore, simulation allows students to build a logical base of understanding that can be applied to much larger systems that cannot be analyzed mathematically. For example, the equations relating to a single caster wheel become too complex when multiple wheels are joined in one system. Use of simulation allows students to see behaviors of complex systems.

Classroom Project 1: Dynamic Analysis for Self-Directed Learning:

This section presents how multibody simulations have been used for the design and analysis of a set of caster wheels. Caster wheels are used at the bottom of platforms for moving heavy equipment in industrial workspaces. Caster wheels are also used for the movement of wheelchairs with the main advantage of maneuverability. The chair is allowed to move in each direction without large steering radii.

Caster wheels are made with different materials in order to withstand a variety of loads. The caster wheel needs to be rigid enough to rotate properly under external loads. However, the caster wheel must have an elastic component (mount) in order to absorb and dissipate energy when hitting a "bump" (shock input) from the floor. This is particularly important for wheelchair user so to maintain an adequate level of comfort.

Casters with built in features for shock attenuation are sometimes referred to as "shock casters". A typical application of a shock caster is shown in Figure 1. In this application, a shock caster is used to support an industrial toolbox. Each caster (rated at 9 kN) has an integrated elastomer isolator. The isolator provides shock attenuation in the event the tool box sees ground input due to floor irregularities.

In this project students have designed a set of caster wheels and analyzed their properties. The caster assembly is simulated using a multibody simulation software by applying a set of loads on the platform and changing the stiffness of the wheels.

The parts of the caster wheel were designed in a parametric, feature-based solid modeling software program (SolidWorks) and then imported into SimWise 4D software to perform further simulations. The simulations aimed at observing both the visual behavior of the mechanical system and graph the interaction forces with the environment.

Thermoplastic wheel: The radius of the wheel is 50 mm and the thickness is 38 mm, the center whole is of 4 mm. All the dimensions are assumed as per standard caster wheel dimensions available on the market. The tools like "sketch", "extrude base" and "extrude cut" are used for the part to be modeled in SolidWorks.

Bracket supports: Bracket supports connects the center hole of the wheel and the connection damper. The bracket thickness was 4mm. Wheels and brackets were modelled with different materials depending upon the purpose of the caster and the mechanical properties to be matched.

Connection Isolator: The connection isolator connects the brackets and the vehicle to each other. This system allows the rotation of the caster orthogonally to the vehicle chassis allowing for steering of the platform. It also allows for isolating and damping of forces transmitted from the floor to the vehicle chassis.

Assembly: Once all the parts are designed in SolidWorks, they are imported into SimWise 4D using a compatible exchange format such as Initial Graph-

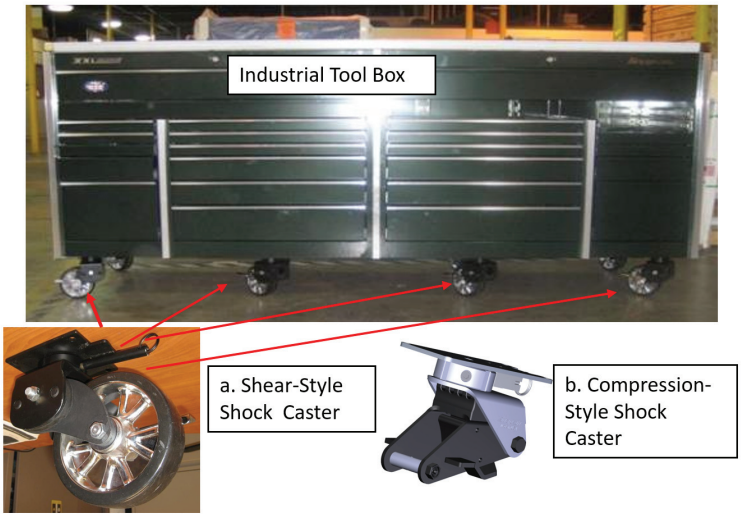


Figure 1 – A shock caster is used to support an industrial tool box. Two styles include: a. Shear-Style where an elastomer mount is loaded in shear to provide isolation and b) Compression-Style where the isolator is loaded in compression.

ics Exchange Specification (IGES). Each part is connected using the proper kinematic constraint and a set of simulations are performed.

Simulation: A set of dynamics simulations were used to perform a sensitivity analysis of the effect of elastomers compliance on shock absorption and vehicle dynamics. Compliance of the caster can have repercussion on non-linear effects of the wheelchair/vehicle dynamics inducing wobbling and shimmy of the vehicle even at moderate velocities. A compromise is required when choosing elastomer compliance. While high compliance reduces the level of shock transmitted to the passenger/payload, it also increases unwanted higher-order dynamics that could make the wheelchair/vehicle difficult to control. The final goal is to find a satisfactory estimate of caster compliance which guarantees the stability of the vehicle and reduces impact shocks.

One single caster model was imported into SimWise 4D. Constraints were added so that the wheel would revolve inside the brackets, the connection isolator would rotate the caster assembly around the vertical axis to steer the vehicle and all brackets were connected to connection isolators with revolute spring / damper to create a dissipation of energy between the wheel and the vehicle should a bump on the road be encountered. After creating a single complete constrained assembly of a caster wheel, three replicas of the same caster wheel were used to simulate a four-wheeled cart, testing the behavior of the vehicle hitting a bump on the road given the stiffness and damping of the connection isolator between the vehicle and the brackets.

The vehicle rolled at an initial velocity of 500 mm/s, and impacted a 10 mm bump. The weight of the vehicle was assumed to be 180 kg. The stiffness of the casters were assumed to be:

Stiffness 1= 40000 N-mm/deg;

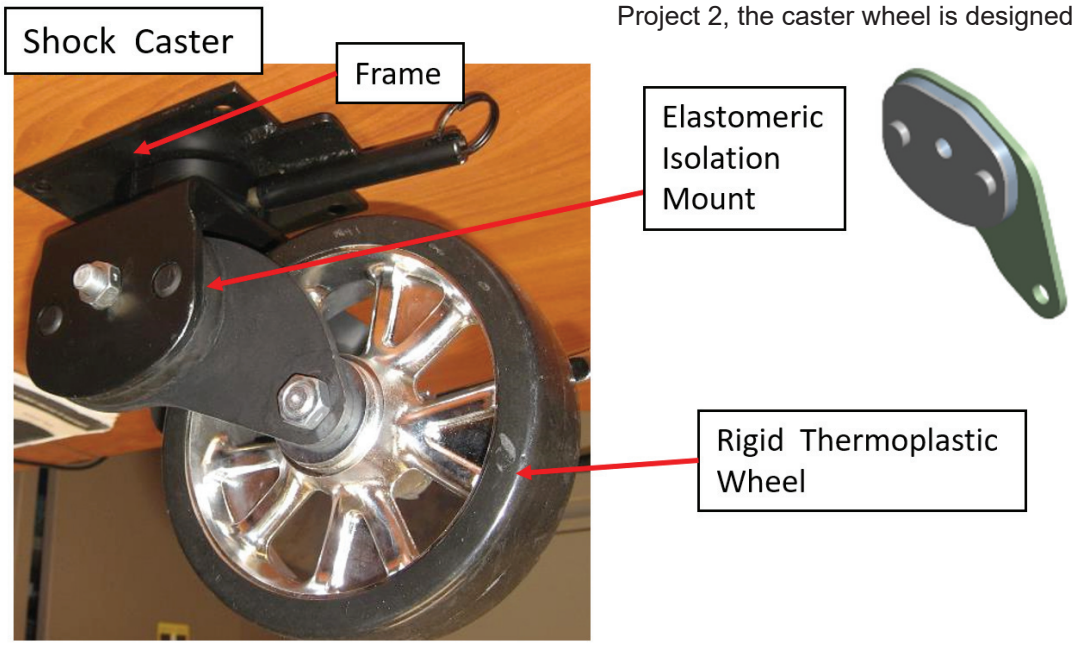
Stiffness 2= 70000 N-mm/deg;

Stiffness 3= 100000 N-mm/deg.

The simulation provided the graphs for position, velocity and acceleration of each caster and vehicle's center of mass. Moreover, an animation of the vehicle hitting the bump was provided where the non-linear dynamic behaviors were clearly observable. These simulations help interpret the theoretical results that can be obtained with the solution of dynamic equations.

The path to become a self-learner was created by first presenting the non-linear differential equation of motion in class. Many of the students were familiar with such an approach where the equations were explained and then solved analytically or numerically. The students were then asked to buy the student version of SimWise 4D and SolidWorks

Figure 2 – Shock caster showing components. For example, Project 2, the caster wheel is designed and optimized.



and implement the behavior studied in class into a simulation. It was found that this method self-motivated the student because they took the simulation as a game. Students were instructed in the use of the software via a set of YouTube videos that explained usage with a practical example. The example was the construction of a four-bar mechanism with spring suspensions. The mechanism in the example was substantially different from a caster wheel but included all the elements that had to be utilized for the realization of the caster's simulation. Student where enthusiastic in seeing that they were able to create a simulation following the video, and were able to observe the dynamics effects discussed in class on a visual simulation. Accuracy of the simulation was confirmed by comparing the SimWise 4D simulation results with graphs presented in class.

Classroom Project 2: Structural Analysis and Optimization for Self-Directed Learning:

Both projects discussed in this paper involve the shock caster but while the emphasis of the first project was on dynamic analysis, the focus of project 2 is on structural analysis. This is another great example of *self-learning* since the project involves individual students using various software tools to design and optimize the rigid caster wheel shown in Figure 2. The uniqueness of the project is that it not only requires the student to optimize the geometry of the wheel, but also to determine an optimal material such that a design index is maximized (the design objective). Students compete with one another to design a caster with the highest design index. A high design index requires a wheel that is strong, stiff and light so that the design index is maximized. Similar projects have been the subject of papers in the past but for simpler geometries such as c-clamps and brackets [9].

Problem Definition

The student is to design and optimize the rigid thermoplastic wheel shown in Figure 2 for static loading. The goal is to determine *both* optimal geometry *and* material such that the wheel is as strong as possible, as stiff as possible, and as light as possible while not exceeding envelope constraints and meeting design requirements. The winning design, is the design that has the highest design index, D, given by:

$$D = \frac{K^{1/3} F_y^{1/2}}{W}$$

Where: Fy = max yield load
K = stiffness
W = weight of wheel

Additionally, the following design requirements must be met:

1. Caster wheel must be manufactured by injection molding using a thermoplastic resin.
2. Caster wheel must safely support a static load of 9 kN (vertical) and 0.9 kN (lateral) with a minimum factor of safety, FS, of 3.
3. The vertical stiffness of the caster must be greater than 17.5 kN/mm.
4. The wheel must be aesthetically appealing!
5. The wheel OD, ID and length must be 178 mm, 28 mm and 57 mm, respectively.

Design Approach:

The first step typically is to determine the optimal material. This is done by utilizing a software program called Cambridge Engineering Selector (CES). The selection of a material for a specific application is a thorough, lengthy and expensive process. Almost always, more than one material is suited for an application and the final selection is a compromise that brings some advantages as well as disadvantages [10]. The wheel can be modeled as a curved beam with free height for the purposes of determining material performance indices [11]. Then, these material indices are used in CES to select the best thermoplastics for stiffness-to-weight and strength-to weight ratios:

Stiffness constraint at minimal mass for beam with free height: $M_1 = \frac{E^{1/3}}{\rho}$

Stiffness constraint at minimal mass for beam with free height: $M_2 = \frac{\sigma_y^{1/2}}{\rho}$

With these material indices, the CES approach is as follows:

1. Insert tree stage and add family of materials of interest (i.e. thermoplastics)
2. Insert a limit stage and filter out materials with percent elongation less than 5%. This will eliminate brittle materials which are inappropriate for this application. Also, insert a maximum price of $100/lb to eliminate any "exotic" materials.
3. Insert a graph stage of modulus vs density. Insert a line with slope = 3.
4. Insert another graph stage of strength vs. density. Insert a line with slope = 2.
5. Go back and forth between the two graph stages raising the line and filtering out materials. Continue to do this until there are 2 – 5 materials left. Select the "best" material – this will be the optimal material for the wheel. This material will be used for the geometry optimization

After the optimal material is found, the next step is the geometry optimization. Students use basic strength of material concepts for curved beams to get some insight as to how the wheel should be designed. Then, students create a design in Pro/E (Pro Engineer) and import it into a finite element analysis program called ANSYS. In ANSYS, students analyze the wheel to determine failure load, Fy and stiffness, K. The student should continue to iterate in Pro/E and ANSYS while keeping the optimal material (found above) the same. Students will continue to refine the geometry until they can no longer increase the design index, D. At this point, both the wheel geometry and material are optimized. The entire design approach is summarized in Figure 3.

Conclusions:

Both projects presented in this paper are excellent examples of self-learning. The wheel design project clearly demonstrates the need for proper material selection, design iterations and refinement. Once the optimal material is found, students typically iterate 20 – 30 times changing geometry in Pro/E and importing this geometry into ANSYS for analysis to determine stress and stiffness. The student must calculate the performance (design) index, D, for each of these design iterations. Students further refine the design to try to maximize this index. This project provides students with a strong foundation in design iterations and optimization while creating an atmosphere of friendly competition. Note, the best student design had a design index of 5,500 which resulted in first place. Some examples of final student designs are shown in Figure 4.

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Figure 3 – Design flowchart for optimization of wheel, includes optimization of material first followed by optimization of geometry.

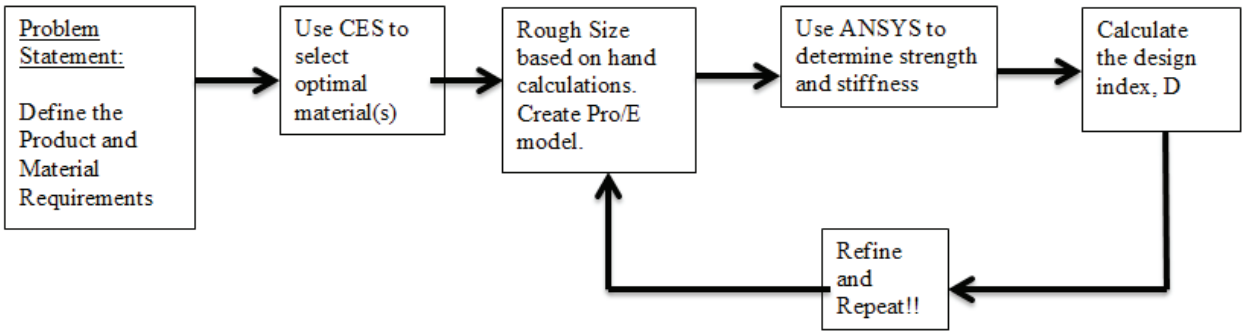

Figure 4 – Student examples of optimized wheel final design.

[7] Wang, J., Fang, A., Johnson, M., "Enhancing and Assessing Life Long Learning Skills Through Capstone Projects", Proceedings of the 2008 American Society for Engineering Education Annual Conference & Exposition, June 22 – 25, 2008, Pittsburgh, PA

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Notes

Critical Review and Extension of the Classification of Learning Skills

presented by Daniel Litynski, Western Michigan University

The Classification of Learning Skills (CLS) was initially created in 1997 then expanded and updated in 2007. In 2017/2018, a team of 10 Process Educators has formed to review and expand the CLS. The CLS is a structure for identifying growth areas in the Cognitive, Social, and Affective Domains. It supports Learning Performance and other performance area including but not limited to Problem Solving, Communication, Teamwork, Decision Making, and Personal Development. This paper will discuss the process used to develop the new CLS and present some new features. These include examples for each skill being examined to help clarify and amplify areas of growth. The new CLS also returns the Assessment/ Evaluation Process area that has eight clusters to support the growth of measurement, assessment, and evaluation skills. The new version includes features should help practitioners when utilizing the CLS.

Notes

Application of the Tri-Square Method in Measuring Changes in Learner Performance

Philliph Mutsiya and James Osler, North Carolina Central University

Measuring the impact of teaching on learning is necessary for discerning relative effectiveness of different teaching methods. Frequently this determination is restricted to hypothesis testing involving the impact of a single variable on a specific performance measure. The common approach is to compare statistics for a treatment group versus a control group with a specified confidence level in order to accept or reject the hypothesis. While this approach may be adequate for clinical studies it is not very practical for a classroom environment where multiple input and output variables are in play. This paper presents the Tri-Square method for studying the interplay between a set of three input and three output variables within a culture or system to look for significance. This is a mixed methods model that can accommodate quantitative and/or qualitative variables. The power of the method is illustrated using student data from a recent Recovery Course.

Notes

CBI 010
5:30pm

Team Meeting

Facilitator: Will Ofstad, California Health Sciences University

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=105

OVERVIEW

This activity is to help shift the mindset of a Process Education learner or researcher to the thinking and behavior of a future facilitator of the learning for others.

PLAN

Readiness: Reflect on each workshop and learning experience from the day and bring insights to the team discussion.

Application:

1) Discuss the learning goals that pertain to your preparation of sharing of your learning
2) Discuss how this learning can be facilitated to have other teams benefit from this learning
3) Make sure that you use your team's research hat to compare and contrast these goals, experiences, and insights gained from this process
4) Document the insights gained aligned with goals and outcomes on your team Thread for Friday Afternoon.
5) Ensure the team is oriented to readiness assignment(s) for the next day.
6) Determine team roles for the next day.
7) Discuss with your team mentor (as needed) 3 mentorship outcomes:
    - o Establish and maintain a Quality Learning Environment
    - o Create an atmosphere of self and peer accountability for readiness
    - o Shifting culture from processing information rather than transferring information
    - o Produce and reflect on team contract, team goals and team learning outcomes
    - o Capture the knowledge and research efforts on the Moodle site

Coordinate a presentation of team learning and research over the entire conference in a concluding gallery walk

Notes

ACADEMY SOCIAL

Voodoo Brewery & Restaurant
101 Boston Store Place
Erie PA, 16501

Join us Friday evening at 6:30 pm for a social gathering at Voodoo Brewery. Voodoo is located in the historic Boston Store building on State Street just a block and a half North of the conference venue - Gannon University's Center for Business Ingenuity. We will enjoy a selection of appetizers provided by the Academy. Voodoo has a large choice of drinks to purchase. Voodoo is a regional craft brewery noted for some on its very unique beers. These include things like Cowbell, a double chocolate oatmeal milk double stout, and Apis Mead – made with honey. Of course you will also find standard favorites such as pilsner, Hoodoo IPA, and Sparkling Hard cider – just to name a few. There are many more. For those wanting an alternative to beer, wine and barrel aged cocktails are available. Voodoo also offers designer sodas (aka - pop), nitro coffee, and nitro tea. The restaurant has a unique industrial style décor where most of the tables are made from recycled pallets. The floor is polished concrete. They even have an open air beer garden – weather permitting! Come have some great appetizers Friday evening and try some of Voodoo's drinks. It will be a great time to meet old friends from the Academy and make new ones as well!

Notes

Saturday
JUNE 16, 2018

Section 4

Session Legend

 Keynote/Plenary
 Symposium
 Workshop
 Distance Workshop
 Poster Session
 Teams/Groups
 Meeting
 Special Event
 Break
 Lunch/Meal

Time		Session Information	Where	Page
7:45 am		**Academy Business Meeting** / Election of Officers	205 (BISL)	4-3
8:30 am		**Team Time** (Facilitator, Will Ofstad)	Lobby	4-7
9:00 am		**Symposium 3: International Initiatives for Increasing i-Generation Student Success** (Facilitator, Wade Ellis)	Lobby	4-9
10:30 am		**Break**	Lobby	
10:45 am	**Parallel Sessions**			
		**Academy Operational Planning** (Matthew Watts)	205 (BISL)	4-19
		**Comparing Profiles of Current vs Required College Readiness** (Arlene King-Berry)	300	4-21
12:30 pm		**Lunch**	Lobby	
1:15 pm		**Plenary Session: Needs and Assets of this Generation of Students** (Facilitator, Shawn Clerkin)	Lobby	4-23
2:30 pm		Team Time and Team Reports	Lobby	4-25
4:00 pm		Awards Ceremony (Joyce Adams)	Lobby	4-27
4:15 pm		**Conference Assessment** (Tris Utschig)	Lobby	
5:00 pm		Adjourn	Lobby	
5:15 pm		**Academy Board Meeting**	205 (BISL)	4-29

Notes

Academy Business Meeting / Election of Officers

CBI LOBBY
7:45am

Facilitator: Mary Moore

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=171

TENTATIVE AGENDA

- Approval of the 2017 Minutes — Mary Moore
- Introduction of Current Board Members — Joyce Brasfield Adams
- 2017-18 Accomplishments — Mary Moore
- Treasurer's Report — Peter Smith
- Election of New Board Members — Matt Watts
- The election slate will be handed out during the meeting.
- Positions to be confirmed.
- Positions to be filled
  - President–elect
  - Secretary
  - Two at-large board members

Academy Business Meeting, Minutes

June 24, 2017

1. Call to order at 7:45am with a quorum established as present
2. Approval of 2016 Minutes
3. Introduction of Board Members
4. Accomplishments of 2016-17 were highlighted and include:
    - Establishment of a Director for Professional Development and acceptance of the position by Patrick Barlow
    - Introduction of an online Professional Development Series
    - New forums introduced at the 2017 Conference including three Symposia and the use of online sessions that allow for remote participation
    - Winter meeting held remotely
    - Review and Revision of By-Laws: The Academy Board recommended, and the membership approved, changes to the Academy By-Laws to create greater alignment between the elected positions described in the By-Laws and the ongoing projects that define the Academy, including the annual conference, professional development, and sponsorship of the IJPE. The proposed changes more directly connect the elected Board Officers to project and committee responsibilities, and at the same time formalize appointed positions for chairs and directors for the annual conference, professional development and strategic planning.
5. Treasurer's Report (see Statement from Peter Smith for 2017 as of May 31, 2017) Libby reported that the Academy's financial records were examined and found to be in good order.
6. Election of New Board Officers and Recognition of Continuing Officers. The officers for 2017-18 are:

    President: Mary Moore

    President Elect: Matt Watts

    Past President: Joyce Adams

    Secretary: Teressa Taylor

    Finance Officer: Elizabeth Mahaffey

    Treasurer: Peter Smith

    Member at Large: Arlene King-Berry

    Member at Large: Josh Hill

    Member at Large: Ingrid Ulbrich

    Member at Large: Chaya Jain
7. Meeting adjourned

Summary of Academy Projects

prepared by Matt Watts, Tidewater Community College (incoming Academy President)

Process Education Primer - It can be difficult to articulate just how the Academy of Process Education can benefit your professional development when speaking to outsiders. The goal of the primer project is to provide the who, what, and why of PE in various forms. There is currently a 36 page document but revisions and/or other versions are being always being considered.

Process Education and Student Success position paper - The IJPE article "Key Learner Characteristics for Academic Success developed the Profile of a Quality Collegiate Learning (PQCL). While the paper provides an excellent framework for the Academy's mission with respect to student success, a condensed version was considered valuable for reaching a larger audience. Several versions of this are in progress including a 5 page document and a learning object.

The Classification of Learning Skills - The Classification of Learning Skills for Educational Enrichment and Assessment was published as module 2.3.3 in the Faculty Guidebook after ten years of work by process educators. The most recent winter meeting in 2018 included a special institute where an update of this organizational tool was initiated. Revisions are still ongoing as we await the newest version of the CLS

Mini-Projects - There are several projects that involve keeping the Academy functioning as an effective organization. Updates to the Bylaws, strategic plan, and conference logistics are re-occurring. Check with the Executive Board and see how you can get involved with these important discussions.

2018 Treasurer's Report as of May 31, 2018

Peter Smith, Treasurer

Balance – Jun 1, 2016		$24,943.55
Receipts	$ 24,616.58	
Expenditures	($ 19,292.50)	
Balance – May 31, 2017		$27,267.63

2017 Conference Receipts and Expenditures

Conference Receipts		
Conference Registrations	$ 13,283.28	
Total Conference Receipts		$13,283.28
Conference Expenditures		
Food and Housing	($ 1,591.01)	
Notebooks/printing/facility rental	($ 1,971.66)	
Journals Editing and Printing	($ 0.00)	
Honoraria; travel expenses	($ 250.00)	
2017 Winter meeting food; lodging	($ 0.00)	
Plaques/nametags/bags	($ 106.90)	
eFGB fee – Pacific Crest	($ 480.00)	
Preconference Institute	($ 4,167.52)	
Total Conference Expenditures		($ 8,566.09)
Revenue over Expenditures		$ 4,716.19

2018 Conference Receipts to date	$18,505.87
2018 Winter Meeting food, lodging	($ 2,582.00)
2017-18 Membership Dues Collected	$ 2,344.56

Team Time

CBI Lobby
8:30am

Facilitator: Will Ofstad, California Health Sciences University

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=105

OVERVIEW

This session is designed to help you prepare to close the conference and document your learning.

PLAN

Readiness: Review the questions individually in advance and prepare for a team discussion.

Application:

Part 1: Each team should provide and document its conclusion or insights to the following questions for sharing Saturday afternoon:

- Question 1: What can an individual faculty do to increase equity in Higher Education both inside and outside the classroom based upon PE Principles?
- Question 2: What can individuals bring back to help their institutions increase equity throughout their colleges?
- Question 3: What can the Academy of Process Educators collectively do to contribute to the national effort to increase equity in Education?

Part 2: What are the five most important discoveries, projects, future efforts, scholarship, new practices that align with the group goals defined at the beginning of the conference?

Notes

Symposium 3: International Initiatives for Increasing i-Generation Student Success

CBI Lobby
9:00am

Facilitator: Wade Ellis, West Valley College (emeritus)

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=174

ABSTRACT

This session focuses on international organizations and programs designed to attract i-Gen students to college and increase their success. The panel will highlight how these ventures differ from those put in place for millennial students. This includes a facilitated discussion on how these initiatives address shifting values, attitudes, beliefs, and skill sets of i-Gen students. Panelist include eminent researchers, policy experts, and organizational leaders.

PANELISTS

Notes

DIY Education - Where To Now?

Betty Hurley, SUNY Empire State College

The realization is growing that entering one's 20s with over 100K of debt is not a great strategy. Learners are now pushing innovators to help them engage in DIY Education, including stackable digital badges, code-academies and apprenticeships. Who will be the winners in this emerging market? And, how will this movement influence our definition of "the educated person"?

Few would deny that the educational landscape is shifting. With the increased cost of a "traditional" higher education consisting of four years in residence, some are questioning the wisdom of beginning a career with what often appears to be insurmountable debt. Books such as *Academically Adrift* (Arum and Roska, 2011) are questioning the benefit of obtaining a bachelor's degree at all. In addition, lifelong and lifewide learning have become the norm, as many occupations require current, updated knowledge and skills.

Ryan Craig, in his book, *College Disrupted: The Great Unbundling of Higher Education*, predicts big changes for higher education over the next decades. Since few people can afford the "traditional" path, entrepreneurial approaches are surfacing. Fro example, in his 2016 book, *The DIY Degree: How to Earn Your Bachelor's Degree in 1 Year Or Less, For Less Than $10,000 Without Classes, Homework, or Student Loans*, Jay Cross speaks from his own experience about how the DIY degree can be accomplished. Ryan Craig discusses the upsurge of Code Academies and programs run by companies that actually pay students to attend, with the understanding that they will then work for the company for a number of years after obtaining their degree. Competency-based learning, which also ahs been around for years, may finally be gaining real traction.

Although digital badges have been around from a number of years, they are gaining credibility as companies like IBM and Microsoft use them for both employees and users of their free online learning opportunities. Pearson's digital badging product, Acclaim, has recently been purchased by Credly. Credly and Badgr (product of an innovative company Concentric Sun), are poised to provide credible documentation of learning outside of the traditional higher education institution. The platform for their digital badges is open source, but the added services they provide will not be. One service Concentric Sun is already providing community colleges in California is a mapping of curriculum paths, using badges and college courses, to attain an Associate Degree.

Wrapped up in all these changes is the essential question- how does one define an educated person? Should higher education be solely to get one that high-paying job? Where do the "soft skills" fit in? Are the "liberal arts" of value any more to degree-seeking learners?

In my presentation, I will highlight some of the recent events and programs that highlight where the DIY degree movement may be heading. I expect to provide more questions than answers!

Notes

Applied learning through high impact practices: a comparison of case studies across institutional contexts

Isiah Brown, SUNY Oswego, School of Business, Visiting Assistant Professor of Management, Inaugural Diversity and Inclusion Fellow

Introduction

For the specific purpose of this panel, the discussant will dialogue about the facilitator's role in implementing volunteer, community engagement and service learning projects across three states (Florida, New York and Texas). Multiple projects with Foodbanks (Texas and New York) were used to foster leadership, civic engagement, and personal development skills for students enrolled in business programs. This model supports the compelling body of literature about the positive impacts of fostering experiential learning strategies. This could also be used to further engage i-Gen learners in the classroom today. John Dewy said we learn best by doing. This approach supports the constructivist philosophy of teaching, helping students with very little knowledge, skills and abilities to develop further develop interpersonal skills need for success in the 21st century workplace (teamwork, networking and communication). From a business point of view, it is critical we continue to promote civic engagement strategies that reinforces social responsibility, ethics, and shaping their moral compass.

SUNY Oswego School of Business

During the fall 2017 semester, four business courses participated in a Thanksgiving food drive. Collectively, the students donated more than 500lbs of food to the Foodbank of Central New York. As a courtesy of goodwill, the Executive Director participated in a speaker series for three business courses spring 2018 and provides resources for students developing business plans around the not-for-profit model. Students continue to work with the foodbank in health and food nutrition program after business course exposure. The interdisciplinary connection is critical for students taking sophomore level business courses, all of which may not be school of business majors. Additional planning is underway to continue strengthening this community partnership to teach student not only about getting all A's in their class but the importance of giving back to the community. The helps to reinforce the transcendent aspect of educational process.

In spring 2017, at SUNY Oswego in the school of business, 45 students from business courses supported two community engagement activities spring 2016 with the Central Foodbank of New York and one with the Downtown Committee of Syracuse and 40Below Syracuse for Earth day cleanup. One of the classes were taught from the SUNY Oswego Metro Center. In collaboration with Enactus (school of business student organization), parents and extended relatives and friends of school of business students, our cumulative efforts with the foodbank produced 80 hours of in-kind service, a $900 dollar donation in the form of JC Penny $25 gift cards for 50 of the 100 families we prepared meals.

School Community and Individual Level

Within the business classes students from Enactus and Zeta Beta Tau (ZBT) emerged and invited students from their organizations to participate. This activity supported the Enactus agenda. Student participants in the class are required to present orally (on the spot) and a one page reaction paper as reflections for the class about the role of volunteering, teamwork, networking and communication from their point of view within a business framework. In three sections of a business course, 73 out of 80 students participated in the Al Rokerthon Guinness Record skate-a-thon spring 2017. The World's Longest Conga Line. This is a noteworthy cause as we discuss engaging in the school community level. In one section of human resource business course at the SUNY Oswego Metro Center, in collaboration with Title IX Coordinator, we engaged in a social media campaign in support of sexual awareness month; #consentissexy was the hashtag used to promote this awareness online within the context of social responsibility at the individual student level.

University of Houston Downtown, College of Business

In 2014, at the University of Houston-Downtown, in the College of Business, the course Business Administration 3300 incorporated a service learning component with the Houston Foodbank with a mini-grant award from the Office of Service Learning and Community Engagement. With approvals from institutional stakeholders, this project resulted in 10,000+ hours of community service engaging more than 2500 students in a two-year period (Fall 2014 – Summer 2016). The objective of this project was to comprise students enrolled in BA 3300 in a service learning activity with the Houston Foodbank. Students employed critical thinking skills to develop well-reasoned solutions to business problems, assessed how group dynamics are utilized in creating effective teams, demonstrated knowledge of ethical decision making, and produce written assignments free of the fundamental writing errors. The students strengthened the academic skills needed for success as a business major and developed a solid understanding of how ethics, teams, professionalism and a strong work ethic affects business operations (https://www.youtube.com/watch?v=zyfmQuiMEuM).

Texas Southern University, Urban Academic Village

In 2011 at Texas Southern University (TSU), the school received a $2.74 million grant from the Houston Endowment for a two-year pilot study to implement the Urban Academic Village (UAV) Learning Community. The project housed two cohorts of 400 freshman students for consecutive years in support of improving the first and second year experience programming for 800 students. This project engaged more than 200 student participants in community engagement and 800+ hours of community service donated to the Houston Foodbank. The UAV collaborated with the Thurgood Marshall College of Law to support this effort.

The purpose of the UAV was to facilitate the transition of freshmen from a commuter campus culture to an academically-charged residential campus culture. Administrators and faculty understood the current practice left freshmen to the vagaries of a commuter campus frequented by its students for a few hours a day when their classes are in session, was not the model for success. The university leadership understood how vital this was to improving the freshman/sophomore experience and the overall student success rate. From this approach, the institution underwent a paradigm shift in the University's culture as a means to increase freshmen/sophomore performance and to improve the rate of retention and graduation. To prepare TSU freshmen/sophomore to pursue their degree plan to graduation, the University instituted a holistic, student-centered, 24/7 academic learning community approach concerned with the freshman's academic performance, mental well-being, emotional stability and physical presence on campus.

Florida A&M University, College of Education

At Florida A&M University (FAMU) in the College of Education, the implementation of high impact practices (volunteer program) in teacher educations program allowed our student to develop hands on skills. In 2004, FAMU received a 5 million dollar grant from the Carnegie Foundation of New York to radically redesign teacher education programs under the auspices of Teacher for a New Era. Teachers For a New Era (TNE) and Title III: Teacher Education and Certification programs and the FAMU Developmental Research School, embarked on a yearlong program implementing the Saturday Prep Academy using volunteer students within the colleges of education and the college of arts and sciences, which housed the professional education unit for secondary education. Some students also received class credit from faculty involved in the project. The leadership of the FAMU DRS recognized a need for increased instruction for K-12 students in the areas of numeracy and literacy as measured by the Florida Comprehensive Assessment Test. Based on the university strategic plan for increased numeracy and literacy efforts across the university, the committee in the College of Education agreed to provide support in the form of tutors from the teacher education program during the 2008-2009 academic school year. The funding from the TNE and Title III programs provided the additional resources to develop a comprehensive teacher education success center.

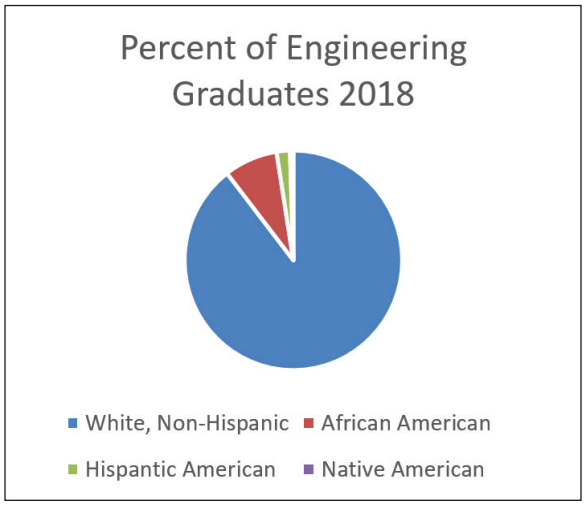
Changes in K-12 STEM Outreach Programs Over the Last 15 Years

Jackie El-Sayed, Marygrove College

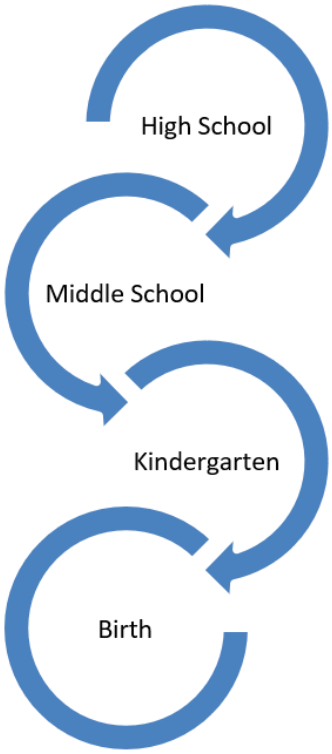
Our nation's need for STEM professionals has increased as has the gap between the number of available jobs and the number of trained applicants. Attracting K-12 students to STEM programs has therefore become a major initiative for professional societies, modern industry, and technical programs. The nature of these outreach programs has changed dramatically to be more attractive to the next generation, especially under-represented populations. This presentation will highlight some of the innovations in K-12 outreach that have emerged across the country.

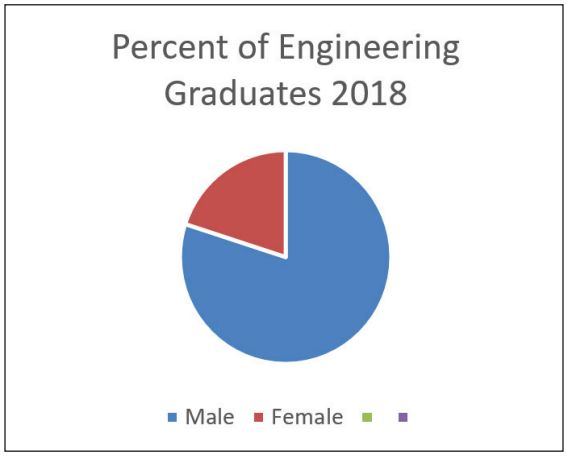
Overview of Talking Points

- Technological Rate of Change
- Strong Workforce Demand
- STEM Sector Diversity Gap
- Increased Awareness of Brain Science
- Data Driven Effective Practices
- Evolution of Outreach Activities
- Timeline of Outreach Activities: Birth to College
- Future of Outreach

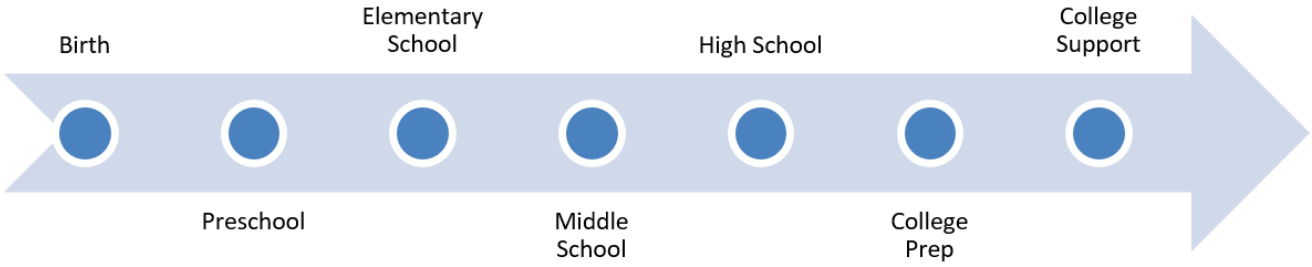


Outreach Changes: Increasingly Early





Timeline of Outreach Activities: Birth to College



Spectrum of Developmental Outreach Activities

Birth-Toys, Audios, Books

Preschool-Montessori-type Activities, Games, Movies, Role-play, Reinforcement

Elementary School- Increased and contextualized classes; NGSS, Cultural competency training, Inclusive biographies, role models, Movies, films, tv, comic books

Middle School- Skills building curriculum, Clubs and co-curricular activities (with increased recognition), FIRST, Magnet schools, STEM Camps

High School- Social media, Career exploration, Museums and exhibits, Narrative of how STEM helps people, Parental education, Dual enrollment, Breadth of curricular and co-curricular engagement opportunities

College Prep- Scholarships, Mentoring, Shadowing, Advising, Campus Visits, Personalization of recruitment

College Support- Institutional goals, Faculty training, Professional associations, Community building, Clustered cohorts, Paid experiential learning, Social justice (EWB), Student success scaffolding

Brief Highlights of 3 Innovative Case Studies

Outreach to Women Students

Outreach to Students of Color

Outreach to Students of Low Socio-economic Status

Future of Outreach

Increased personalization of education

Global interaction

Public policies to promote STEM education (i.e. CTE funding) and remove barriers (i.e. internet access)

Innovative Bachelor of Technology/Master of Engineering

Jim Morgan, Charles Sturt University

Charles Sturt University (CSU) is developing an exceptional community of student engineers who are blazing a new trail in engineering. CSU's Bachelor of Technology/Master of Engineering (Civil Systems) is a qualification unlike any other. Developed in consultation with industry leaders to meet demand for entrepreneurial engineers, this double degree builds engineering expertise over five and a half years.

CSU's engineering course is designed around project-based learning, where workshops replace lectures, projects replace exams, and our innovative and agile Topic Tree replaces semester-long subjects. Combine that with four years of paid work placement and the result is one of the most innovative and dynamic engineering degrees in Australia. Students study fulltime (approx. 40hrs per week) for the first 18 months at CSU's award-winning engineering facilities in Bathurst, then four years part-time whilst working within the industry.

Points of Distinction

As one of Australia's only undergraduate-entry master's level engineering programs, CSU Engineering is designed to empower graduates with the knowledge and skills to make a difference in the world.

1. **Innovative curriculum**

   Developed in collaboration with industry and engineering education experts from around the world, our program is based on what works to meet student engineers' current and future learning needs.

2. **Entrepreneurial graduates**

   As the only Australian engineering school hosted within a business faculty, we unite technical excellence with communication, financial and management skills to enhance your ability to contribute as a leader in the field. Our program also proactively ensures that women, regional, mature and Indigenous students are well represented in our student body.

3. **Breadth of experience**

   You will study under a dedicated team of academic staff with extensive industry experience in Australia and overseas. On work placements – offered in both metropolitan and regional areas, and in government and the private sector – you'll gain valuable experience, skills and insights that will make you a competitive, job-ready graduate.

4. **A head start on chartered status**

   Because CSU's engineering qualification includes undergraduate and postgraduate study and industry experience, it gives you much more than the minimum requirements to become an engineer. The industry placements accelerate your progress towards acquiring many of the competencies of a Chartered Professional Engineer (CPEng) before you graduate.

5. **Quality facilities**

   Incorporating the latest technology, CSU's award-winning engineering facilities include a collaborative learning zone, maker studios, project spaces, workshops, a gallery and a 'pitch zone' for fine-tuning entrepreneurial skills.

International Recognition

A report comissioned by global leader in engineering education and research, Massachusetts Institute of Technology (MIT) has identified Charles Sturt University (CSU) as one of the top four emerging engineering courses in the world and has described the CSU degree as ***'completely rethinking what engineering educating should look like'.***

The recognition of CSU Engineering is the result of a benchmarking study of global state-of-the-art undergraduate engineering. The study, which was commissioned by MIT's New Engineering Education Transformation (NEET) initiative, a program of reform in undergraduate engineering education at the Institute, and authored by Ruth Graham, was released on March 27.

Career opportunities

Exciting opportunities exist for engineers to help design and implement new technologies in Australia and internationally.

- **Infrastructure:** Redesign the roads, rail and airports that will carry the planes, trains and automobiles of the future; or design bridges, dams, pipelines, buildings and other structures to withstand ever increasing environmental risks.
- **Resource Management:** Manage land and water resources to mitigate the risk of droughts and floods; innovate in our agricultural sector or remote communities to ensure the effective use of water resources; and provide clean drinking water.
- **Private enterprise:** Work for a technology-related start-up company – perhaps even your own!

Notes

205 BISL
10:45am

Academy Operational Planning

Facilitator: Matthew Watts, Tidewater Community College

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=177

OVERVIEW

Academy Operational planning began in the winter meeting as a way to support the strategic plan. Board members and other active members have refined the operational plan further during the spring. This workshop will help you familiarize yourself with the operational plan and the structure of the Academy itself. Participants will review the bylaws, strategic plan, and current operational plan. Opportunities to suggest changes to the plan and thus the direction of the Academy will be provided. Attend the workshop and find out what role you can play.

LEARNING OUTCOMES

- Expand awareness of ongoing Academy activities/projects, especially tasks that need to be done to make these successful.
- Identify roles where you could add value to the Academy of Process Educators and at the same time advance your professional interests.
- Clarify performance criteria for key Academy roles and generate ideas for helping those in these roles fulfill their duties more efficiently and effectively.

RESOURCES

The Academy Bylaws	The Academy Operation Plan
The Academy Strategic Plan	The Academy Roles and Offices

PLAN

- Read the Planned Workshop Resources (before workshop)
- Overview of Operational Planning (10 min)
- Work in small groups reading/reviewing The Academy Operational Plan and respond to the critical thinking tasks (40 min)
  - Find and correct 3 items that need to be corrected or updated in the strategic plan
  - Find 3 items that need to be clarified or explained better and provide questions for them
  - Provide 3 activities you think is missing from the Operational Plan and add them to the operational plan, completing an entire row for each.
  - Identify 1 activity or role that each group member is interested in and explain why
  - Create 3 Academy roles not described in the bylaws that would support the operational plan.
- Public reporting/discussion of findings (30 min)
- Conduct workshop assessment (10 min)

Notes

Comparing Profiles and Gaps between Current & Required College Readiness

CBI 300
10:45am

Facilitator: Arlene King-Berry, University of District of Columbia

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=180

OVERVIEW	There is a gap between how prepared students are when entering college and the expectations of college readiness. A literature search will be provided as a base for participating in the workshop. The work produced during this session will use the opportunity of having twenty Gannon students participating in the afternoon Plenary session as a collaborating resource. The participants will be analyzing two Profiles that are provided with respect to fifty learner characteristics– one which represents the current norm of entering traditional age (i-GEN) students key learner characteristics and one of traditional faculty and college expectations for college readiness. The outcome will be clarification of the gap that the Freshmen Seminar (Learning to Learn: Becoming a Self-grower) curriculum needs to close as well as the central problem that the Recovery course has to solve.
PLAN	(Look for the facilitation plan on the Conference Support Site.)

Notes

CBI Lobby
1:15pm

Needs and Assets of this Generation of Students

Facilitator: Shawn Clerkin, Gannon University

OVERVIEW

This session will involve up to twenty students from Gannon University who work along with faculty to interactively explore the true assets that this generation brings to college. This will include identification of preferences that this generation has for learning/teaching practice and definition of learning needs that this generation sees as a priority to strengthen their ability to be collegiate learners. Students will be paired and will do a speed dating rotation among conference participant teams. As students visit each base group, the base group members will use their conference experience by asking inquiry questions to advance their team goals and reflect on their own teaching practice. Each base group and student team will produce two insights that will be shared at the end of the session.

Notes

CBI Lobby
2:30pm

Team Time & Team Reports

Facilitator: Will Ofstad, California Health Sciences University

http://www.processeducation.org/moo/moodle/course/view.php?id=2#section-1

OVERVIEW	The goal of this session is to consolidate, celebrate, and communicate learning that has occurred throughout the conference (a) through various team reports on discoveries associated with each of the team goals and outcomes and (b) through a SII on the conference overall.
PLAN	Team Reports (2:30-4:00) 1) [30 min] Prepare for team presentation of team goals outcomes from the conference as a poster. Creativity encouraged. 2) [15 min] Prepare 3 strengths, 3 improvements, and 3 insights about the conference overall as a second poster. 3) [30 min] Present team outcomes and conference SII, every team has 5 minutes of spotlight. 4) [15 min] Facilitated intra-team discussion Conference Assessment (4:15-5:00, facilitated by Tris Utschig) 1) [20 min] Participate in round robin testimonials and concluding thoughts. 2) [15 min] Complete the conference assessment form individually.

Notes

Awards Ceremony

CBI Lobby
4:00pm

Facilitator: Joyce Adams

Academy of Process Education Awards

DISTINGUISHED PROCESS EDUCATOR AWARD

will recognize individual accomplishment over a period of years in two or more of the following areas...

- substantive contribution to scholarship in teaching/learning that supports the theory and practice of Process Education
- innovation in curriculum and/or program design that promotes life-long learning skills and academic success
- facilitation of exemplary personal and professional learning outcomes among diverse student audiences
- delivery of faculty development events and mentoring experiences that have had a broad impact on other Process Educators

LONGSTANDING CONTRIBUTOR TO THE ACADEMY OF PROCESS EDUCATORS AWARD

will recognize significant service to the Academy of Process Educators over a period of at least 5 years in two or more of the following areas...

- Elected or appointed membership on the Academy Board of Directors and active involvement in the work of the Board
- Attendance at the annual conferences and volunteering for one or more of the many conference roles.
- Leadership in establishing/improving a local Academy chapter or supporting Academy-sponsored campus events during the academic year.
- Participation on the editorial board as well as mentoring prospective authors in article preparation for the International Journal of Process Education.

INSTITUTIONAL LEADERSHIP IN PROCESS EDUCATION AWARD

will recognize an institution/individual that practices and promotes the principles of process education in at least two of the following ways:

- Has hosted at least one Academy Conference
- Has an administration that supports and promotes the practice of process education principles in curriculum and/or program design

- Has an identifiable core of faculty members that utilize and promote the principles of process education

ACADEMY'S RISING STAR AWARD

will recognize an individual who has participated in the Academy for less than three years and has

- Demonstrated a passion for Process Education
- Exhibited a desire to further the mission of the Academy
- Presented in at least one conference
- Has volunteered in one or more activities or supporting roles within the Academy

2018 CONFERENCE AWARDS

BEST PERFORMING TEAM AT THE CONFERENCE

- Posting daily preparation for conference activities
- Developing at least one critical thinking question prior to each facilitation
- Posting Team's SII of its performance (2 strengths, 2 improvements and 1 insight) daily

BEST PAPER 2018

The best paper will:

- Address conference theme
- Present significant process education research topic
- Advance scholarship on teaching and learning
- The best paper will be forwarded to the editorial board of the ***International Journal of Process Education*** for consideration for publication.

BEST POSTER PRESENTATION

- Reflects Process Education teaching and/or research
- Informative and interesting title
- Colorful layout
- Strategies and ideas for implementation

205 BISL
5:15pm

Academy Board Meeting

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=185

AGENDA

1. **Introduction and welcome of new board members** (Matt)
2. **Approval of Academy meeting minutes** (Teressa)
3. **2018 conference assessment** (Tris)
4. **2019 conference planning** (Steve and Dan)
    - Location (University of South Alabama)
    - Theme: Learning to Learn in STEM (and Beyond)
    - Checklist review
5. **Operational Plan for 2018-2019**
    - Strategic Plan Update (Joyce and Mary)
    - Operational Plan (Matt)
    - Potential IJPE Papers
    - Research Project (Dave)
    - Winter Meeting
6. **Board Meetings** (Matt)

RESOURCES (ONLINE)

Minutes from 2018 winter meeting

Conference planning checklist

Strategic Plan

Operational Plan

Notes

Sunday
JUNE 17, 2018

Section 5

Time		Session Information	Where	Page
8:00 am		**Academy Research Strategy and Mission** (Facilitator, David Leasure)	CBI 300	5-3
8:15 am		**Review Research Opportunities** (Facilitator, David Leasure)		5-5
8:35 am		Re-seat according to interest and get to know your group		
8:45 am		Identify research/publication projects of interest		
9:15 am		Break – review forum postings over break; re-align with new groups if desired		
9:30 am		Use PSM to define your table's interests. Focus on steps 1-2		
10:30 am		Brief the group on your table's top interest		
10:40 am		Continue working with your group on PSM steps 3-5		
11:10 am		Develop project plan for your group. Post to forum.		
11:45 am		SII Assessment of group work		
12:00 pm		Adjourn		

Notes

PE Research Session

CBI 300
8:00am

Facilitator: David Leasure

http://www.processeducation.org/moo/moodle/mod/forum/view.php?id=188

RESEARCH GOALS SURROUNDING CONFERENCE	• Develop research skills in Research Workshops • Network to identify common interests and form research teams • Develop or join research projects • Develop plans for post-conference research • Identify support needs that could be met by the PE Academy • Increase publication for faculty and the IJPE • Improve awareness in Academia for the PE Academy • Use ResearchGate or other system to create awareness and support collaboration	
PRE-CONFERENCE PREPARATION	• Use the PE Academy Research Forum to identify research areas and projects of interest. • Volunteer to be a team lead. • Readings as found in the research forums. • Join the ResearchGate.com PE Research Lab by emailing david@pcrest.com	
RESEARCH WORKSHOPS	• Qualitative Research on the Recovery Course, Wade Ellis • Universal Performance Potential, David Leasure • Measuring Professional Development Quality in Producing Certified Transformational Learning Educators, Mark Terrell • iGens and the Rest of Us: Seeking Cultural Competence to Improve Student Success, Mary Moore and Ken Colburn • Researching the Recovery Course, Dan Apple	
AGENDA	8:00 am	**Convene Group/Form Teams** - Academy Research Strategy & Mission - Review Research Opportunities - Group by Interest Area - Inventory Initial Ideas and Poster to Research Forum

AGENDA (con't)

9:00 am	**Scope Research Ideas** - Review Forum Postings - Apply PSM Step 1 to Define Problem(s) - Apply PSM Step 2 to Inventory Key Issues/Ideas/People - Post Results to Research Forum
10:30 am	**Refine Research Ideas** - Apply PSM Step 3 to list relevant research and key missing research - Apply PSM Step 4 to identify constraints and assumptions - Apply PSM Step 5 to identify subproblems - Post results to the Research Forum
11:15 am	**Operationalize Research Plans** - Apply PSM Steps 6-10 to clarify deliverables and milestone dates for sub-problems - Assess your team's work (Strengths, Opportunities, and Insights) - Post results to the Research Forum

PSM — Problem Solving Methodology – Apply to the Research Problems		
Step		*Explanation*
1	Define the problem	Identify and clearly state the problem.
2	Identify key issues	Determine important issues associated with the problem.
3	Collect data and information	Collect and assess available information relevant to the problem; determine what information is missing.
4	Identify assumptions	Clarify what assumptions are being made concerning the problem.
5	Break the problem apart	Separate the problem into smaller sub- problems.
6	Model sub-problems	Generate solutions for each sub-problem.
7	Integrate solutions	Integrate the solutions from sub-problems into the main problem.
8	Test and validate	Validate the solution; assess the quality of the solution.
9	Generalize the solution	Determine how to generalize the problem solution for use in other situations.
10	Communicate the solution	Present the solution in oral and/or written form along with documentation of the process.

Post-Conference Activities

Make a public commitment to your project on ResearchGate.com. Post your project description and a rough time frame. Commit to regular updates, between 2 to 4 weeks apart. Use the PE forums or email for small research group communications. The top 3 teams for productivity and impact will be recognized at the 2019 PE Conference. Opportunities for webinars and workshops through the PE Academy will be identified.

Sampling of Research Project Opportunities

Contact david@pcrest.com for more information.

- Research Methods: Quantitative & Qualitative Research in Process Education
    - Workshop at PE Conference 2018
    - Extensions applicable to PE
- Academy & Institutional 3-yr Collaborative Research Project: Researching the Recovery Course impact — Openings Available
    - Impact on recovered student graduation rates and other metrics
    - Improvements in equity group achievements
    - Institutional Benefits
    - Improved Implementation Process

- Learning to Learn
    - Framework for measuring the effectiveness (impact) of a Learning to Learn Experience
    - Power of the Learning to Learn Course (Recovery Course) to produce the Profile of 1st Year Collegiate Learner
        - Specializing and proving Learning to Learn by subject area such as Math, Chemistry, Engineering, Education, Computer Science, Psychology
        - Generalized implementation in a discipline
    - Application of the Classification of Learning Skills V2
    - Generalizing the Implementation of a Learning to Learn Course
    - Comparison of face-to-face, online, and self-study
- Research of Methodologies
    - The role *Generalizing* plays in the learning process and preparation for Problem Solving
- Uses of the Risk-Characteristics Model
    - College Readiness
    - Career Readiness
    - Professional Life-long Growth & Performance
    - Use in STEM Disciplines to Improve Discipline-specific Risk Factors
- Transformation of Education — research on any subset of the 14 areas
    - Implementation case studies
    - Analysis of barriers
- Universal Performance Potential
    - Workshop at PE Conference 2018
    - Research agenda

Research Problem:		
Step		*Summary*
1	Define the problem	
2	Identify key issues	
3	What do we need to collect (data and information)?	
4	Identify assumptions	
5	Break the problem apart	
6	Model sub-problems	
7	Integrate solutions	
8	Test and validate	
9	Generalize the solution	
10	Communicate the solution	

Research Component of the 2018-2020 Strategic Plan

Draft for Comment

Goal 1 – Build an academy research program.

Objectives:

I. **Build and sustain a significant and valued research community through the International Journal of Process Education (IJPE)**

- A. On an annual basis, publish the International Journal of Process Education (IJPE) as a forum for members and external educators to present new theory and research relevant to process education.
- B. Maintain a Board of Editors who will collaborate to continually improve the quality of the review process for the journal.
- C. Continually improve the IJPE website to assure clarity and effectiveness of editor instructions and procedures for authors, including format information, reviewer criteria and standards, and timelines.
- D. Collaborate with submitting authors through mentoring and technical editing on a timely basis to assure quality of published articles.
- E. Disseminate IJPE issues through the Academy website and make articles available through scholarly databases.

II. **Support members' research capabilities**

- A. Create workshops on all member-beneficial phases of educational research
- B. Sponsor sessions at the annual conference

III. **Develop the organizational research policies and procedures handbook**

- A. Project proposals
- B. Review applications
- C. Protection of human research subjects (IRB)
- D. Oversight of research
- E. Non-IJPE publication
- F. Data archiving
- G. Timing of Proposal Submissions & Approval

IV. **Pilot Research Project on Psychology of Learning & Success with Academy member institutions**

V. **Publicity & Coordination (does not need to be in the research strategy)**

- A. Linked-In (Ingrid Ulbrich)
- B. Facebook (Denna Hintze)
- C. Academia.edu or Researchgate.com (David Leasure)
- D. Blogging/Reports

VI. **Member engagement to implement this strategy**

- A. Workshop development
- B. Working groups for the procedures
- C. Non-sponsored PE project reporting
- D. Conference Themes